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Cooker Development.

LAST year we welcomed the appearance at the I.M.E.A. Convention at Eastbourne of preliminary samples of the British standard cooker as a hopeful sign that manufacturers were getting nearer to common agreement as to the best design to fill the greatest need; there is little doubt that the widely differing designs of cooking equipment which appeared on the market during the previous few years, and the great divergence of ideas and opinions on the subject, had not produced too good an effect on the minds of existing and prospective consumers. Since its first appearance, however, little has been seen or heard of the outstanding development of last year, and the question is naturally asked: has the work towards standardisation ceased?

Impressions formed as the result of a visit to the Birmingham section of the British Industries Fair confirm our opinion that this is not the case, and that, "official" standardisation or not, the problem is being solved by the joint efforts of the manufacturer, the supply engineer and, indirectly, by the consumer, who is probably the most important contributor. It is evident that blind insistence on fixed ideas is not the line of approach of individual makers; rather are they out to express the consumers' ideas.

With a very few outstanding exceptions, little really new in principle is displayed, but there is strong evidence of the proved details being brought together to consolidate a position of which simplicity is the keynote. Plug-in element units, wiring on the bus-bar principle, with no wiring exposed beneath the boiling plates, vitreous enamelling throughout, and easy accessibility to fuses, switchgear, wiring, &c., appear to be generally agreed upon, mostly in accordance, we believe, with the I.M.E.A. Committee's recommendations. Manufacturers seem to be reluctant, however, to sink their individual ideas on such points as their particular types of oven elements, and we feel that this is probably to the good; after all the consumer is not concerned with the construction of the element so long as it gives the required heat in the desired manner.

Of particular interest is the popularity gained by the "baby" type of cooker. Most models of this description were introduced, in the first place, to fulfil the requirements of only a couple of persons, or to serve in small flats, &c.; but many consumers with families of four or so persons are finding the "baby" sufficient to meet their needs. Does this mean that operation capacities of electric cookers are generally under-rated?

Thermal-storage cooking is, of course, not new, but this is the first occasion, we think, that a leading manufacturer in this country has featured the idea so prominently. Electrical apparatus for cooking in this manner was introduced abroad to encourage consumers to take supplies of electricity during night or off-peak periods at very low rates, and the scheme has undoubtedly met with much success. Where, however, special cheap rates are not available, it is a question whether the consumer will be sufficiently interested to

adopt what might appear to involve new principles of cooking. On the other hand, as with thermal-storage water heating, the idea commends itself to the supply engineer as a means of helping to fill up the load-curve valleys, and from that point of view the subject is one which should receive very careful consideration. It has been suggested that a constant cooking load would prove very undesirable in that it would in many cases actually add to the peak, and time-switch control has been put forward as a means of overcoming this difficulty; but this would involve additional expense.

The End of the Fair.

The British Industries Fair closes to-day, and to-day we publish the third and final section of our articles describing the electrical and allied exhibits. If the Home reader has been wearied by this account of typical British products that are on the market, let him join with us in the hope that the overseas reader will utilise the information for sending business home to British factories. It is too early to say what benefits the Castle Bromwich display has brought or will bring to the electrical trade—one can generally gain different opinions on different stands. There are again, as there nearly always are, in our experience, some who hold that the time is ripe for a purely electrical exhibition run by the industry. Those who hold this view just now are invited to express themselves in our "Correspondence" columns. We think we sense a growing feeling that the time has really arrived for thinking about it for 1932 or 1933. We should like to feel the pulse of the industry on the point; but whatever the future brings in this connection it is certain that no Fair will be complete without a representative collection of our national electrical manufactures. Perhaps it will prove that the running of the textile exhibit as a separated unit has shown the way for other trades.

Are We Awake?

Not many months ago we placed the strongest possible emphasis on the importance of British electrical manufacturers and traders taking definite measures to secure a share of the big business that is scheduled for Canadian hydro-electric development during the next three years. Sixty million pounds and a vast sum upon incidental electrical requirements! What is being done? Some of our friends in Canada seem to be under the impression that we do not care; that we have not the will to win; and that we have based latter-day conclusions upon past years of disappointment. They say that things of great moment are happening in Canada which make it necessary for us to be there "right now" in order to bring pressure to bear upon the authorities who are shaping the Canadian Electrical Code. We have waited long enough in all conscience for change in the situation as affected by the Underwriters' handicap. Some have taken bold individualistic action and spent much money trying to counteract United States preferences and remove, or at any rate lessen, the handicap; but without covering all the old ground, we once more urge our manufacturers and their organisations not to let the present opportunity slip past them. Rumour has it that something is being done by one association representative of all industries, but are members of the electrical trade satisfied that everything possible is being done to deal with their special case and to uproot the obstacles that lie in the path of their progress? We shall not win in Canada unless we have the strong individual will.

On Toast.

It was certainly unfortunate that Sir Frank Heath, at the recent E.R.A. luncheon, should have chosen so inapt an illustration as he did of the need to realise the significance of comparative trifles. We refer, of course, to his disparagement of the electric toaster, which has received publicity in the daily Press utterly out of proportion to its importance.

His remarks on the subject had the effect of diverting attention from the value of the work done by the Association to an entirely irrelevant side issue; they were also demonstrably inaccurate. We do not believe in the policy of pretending that no electrical appliance can be improved, particularly if intended for domestic use, where the user is unskilled and often unreasonable. Indeed, we think there is a great deal of room for research in this field. As a matter of general experience (including our own) electricity is ideal for toast-making; and its use for the purpose in the best restaurants provides additional evidence of its virtues.

Welded Ships.

The material improvement of the technique of electric-arc welding during recent years has progressively increased confidence in its practical application. So much so indeed that the method is fairly extensively used in the construction of steel-framed buildings, bridges, cranes, and for fabrication and repair in the engineering trades. It is, nevertheless, regrettable to have to record that less progress is observable in the shipbuilding industry than in any other, although no better opportunity offers itself for the introduction of the system on a large scale than in the construction of ships.

The first all-electrically-welded vessel is believed to have been built in England during the Great War; experiments on a more extensive scale have since been carried out in America and Germany (reference to the latter will be found on another page) all of which seem to indicate that electric welding should enable marine architects to build ships of greater strength and of less weight than is possible by adhering to the hitherto customary riveting, albeit at a somewhat greater cost. Extended application will, however, simplify procedure and provide both designers and welders with further experience, which should thus tend to reduce cost and possibly be the means of electrically fabricating ships by welding in a more profitable manner than present practice permits.

A Swan Memorial.

We commend to the notice of our readers the appeal issued by the Institution of Electrical Engineers for a suitable memorial to that man of rare genius, Sir Joseph Wilson Swan, the inventor of the incandescent electric lamp.

A few months ago we kept our readers in touch with the preliminary arrangements then being made in Sunderland and Newcastle-on-Tyne with a view to founding national scholarships in electrical engineering science in recognition of Swan's achievements.

Further particulars are given in our "Notes" section this week. There can be no reason to doubt that the response will bear some relation to the personal qualities of Swan, not only as an inventor, but also as a man.

Practical Co-operation.

One of the principal tenets of the electrical contractors is that each man should stick to his own job, and one of their principal grievances is that supply authorities do not always follow this rule for they often enter the installation field. Without discussing the merits of their case, we must agree that if a man does his particular job thoroughly he is the best one to do it.

This is evidently the view of the Shropshire, Worcestershire and Staffordshire Power Co., which by means of a special E.D.A. Circle obtains the co-operation of the electrical contractors in its area, and while encouraging and assisting them to obtain more and more installation work adds constantly to its load. Only contractors of standing are admitted to the Circle, and thus members of the public who look for the special sign which is being displayed by these contractors can feel assured that their work will be done satisfactorily.

The Power Company by thus bringing its own interests into harmony with those of the contractors and the public has set an example worthy of emulation.

Electric Breadmaking.

Bakeries Provide a Valuable Load for Supply Undertakings Offering Special Off-peak Rates.

By THOMAS H. LEAK.

BREAD is a daily necessity, and in most old country and farm houses may be found the brick baking oven which had to be fired with wood piled in the centre of the oven. The majority of commercial bakeries still use similar, but larger, ovens and a number of them date back many years. On one being replaced by an electric oven some time ago the maker's name was indecipherable, but a portion of the date of seventeen hundred and something could just be traced.

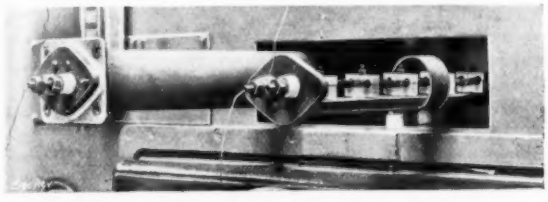


Fig. 1.—Elements in Steam-tight Tubes.

Frequently ovens in underground bakeries were constructed under the street, the back being about half way across, the arched roof of the oven forming the integral support for that portion of the street immediately above. The substitution of modern equipment under such circumstances is practically an impossibility. The conditions of working in these bakeries amid the heat and coke fumes leave much to be desired, and the health of the men suffers in consequence. In most modern bakeries steam-pipe ovens are used, and where the furnace is entirely outside the bakery better conditions prevail. Furnaces are either fired by coal, coke, or oil. With what are termed "side-flue ovens" the firing must be done in the bakery itself, with consequent dirt, dust, and fumes.

Many progressive bakers have long realised the all-round advantages of the electric oven, but the chief obstacle to its more general adoption has been the price of electricity. This deterred manufacturers from placing commercial ovens on the market, and they confined themselves to types suitable to the requirements of the small cake and confectionery shop where little, if any, bread is baked. As no flues are required these ovens may be used actually in the shop; the customers see the goods baked, the fascination of which leads to increased trade.

A few years ago several supply authorities began to realise the advantage of offering an attractive rate to bakers who operated their ovens during the night, and that part of the day which did not overlap the peak period. This induced manufacturers to turn their attention to the production of larger baking ovens on a commercial scale suitable for the requirements of the baker with a bread as well as a confectionery business.

A further drawback is that the greater percentage of bakeries are leasehold, and the tenant is faced, unless he has unlimited space, with the problem of removing his brick ovens to make room for the electric ovens, and the possibility of having to replace the original ovens at the termination of his lease. As the use of electric ovens becomes more general, the landlord will probably waive such conditions, and regard the substitution as an asset to his premises. Again, even if no conditions are imposed, the tenant may find his brick ovens form part of the structure of the building, and only at great expense can they, with safety, be removed.

Bakers who first started with one electric oven have now in many cases scrapped all their old-fashioned plant for more electric ovens; one electrical manufacturing firm alone has supplied over five hundred electric ovens, and examples of the newer methods will have to be included in the lists of every oven builder.

As the electric oven enables the heat to be so perfectly controlled, it is well ahead of its competitors. With the side-flue oven intervals are necessary for re-firing, but the electric oven permits of continuous baking. As soon as one batch is withdrawn another can follow. In brick or portable steam-pipe ovens the pipes are placed under the roof of the oven and under the tiled sole. In the electric oven the elements are in the same position, but the process of heating is different. The small amount of water in the steam pipes, which are of necessity enormously thick with a very small bore, must be heated slowly or burst tubes will result. The elements in the electric oven are also placed in tubes (fig. 1) which are steam-tight, but as the use of the tube is merely to prevent the access of steam to the element, they are of comparatively light gauge. In ovens where the manufacturer employs elements wound on a porcelain or other base and not inserted in tubes, these are suitably protected to prevent the access of steam. As opposed to the steam-pipe system, the current may be switched on to "full," and, therefore, the temperature of the oven almost immediately commences to rise. In the reverse direction the temperature may be more quickly lowered, but with steam pipes, owing to their thickness, the heat is retained for a considerable period after the fuel has been withdrawn from the furnace chamber. The advantage of the electric oven to the baker who has only one oven is obvious, especially if it be one of the

Fig. 2.—Electric Dough Mixer and Water Heater.

double-deck type as, having separate controls, each deck can be kept at a different temperature. A further advantage is that the top and bottom elements being controlled independently by three-heat switches, every possible range of heat may be obtained at will, while each deck has its own set of elements. The use of one or both decks is optional, and during certain seasons one may be sufficient, thus permitting the utmost economy in energy consumption.

The coldest part of any oven is naturally nearest the door, but in the electric oven the elements are so arranged as to give extra heat at this point, and so counteract this defect to a great extent. Such an arrangement, coupled with the complete switching control, enables the baker to produce an evenly baked batch of bread, the loaves nearest to the door being baked to a degree uniform with those at the rear.

Steam is frequently used for ordinary bread baking, and it is essential for Vienna bread. This may be generated by placing water in a vessel in the oven, allowing water to circulate in ducts around the interior of the oven, injecting from an ordinary coke boiler, or by the modern method of raising steam in a pressure boiler fitted with electrical immersion heaters. An electrical storage tank of 100 gallons or other suitable capacity, according to requirements, is usually installed to feed the pressure boiler, and the former also supplies hot water for the tempering tank for the dough mixer, for washing up, &c. The dough mixer can be driven by an electric motor, so it is possible to provide an all-electric bakery (fig. 2).

An illustration of the comparative space required for the electric oven as against fuel fired ovens may be of interest. In fig. 4 we see an electric oven on the left-hand side of two side flue ovens. The capacity of the former, occupying less than half the space, is equal to that of one only of the brick ovens, and yet the electric oven, enabling continuous baking to be carried out, will bake more than the two brick ovens in the same time. The firing of the latter was done from the front between the two ovens. In the case of a steam-pipe oven provision for the furnace and room for stoking would have to be made at the rear, bringing the front of the ovens further forward in the bakery, unless it were fired externally. In the latter case space is naturally required for this purpose.

Fig. 5 illustrates the same bakery three years after. The brick ovens have been removed, and another electric oven installed. There is still room available for a further oven, if necessary. With the present plant more than four times the output of the brick ovens can be obtained in the same area.

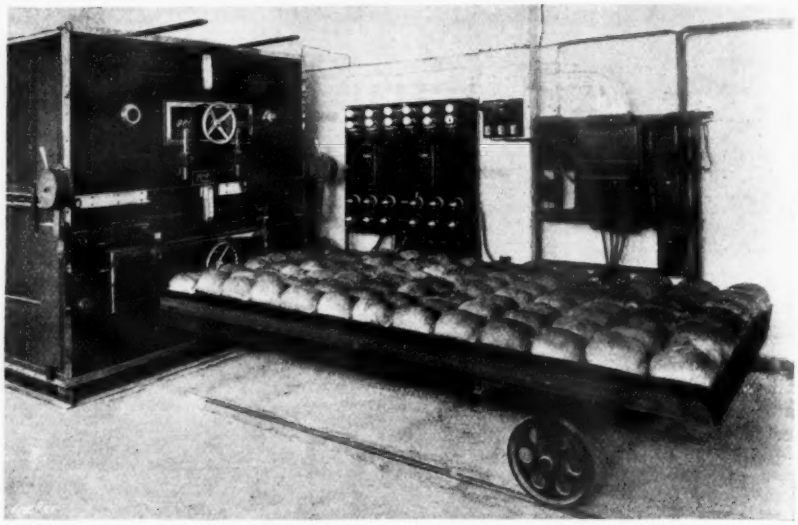


Fig. 3.—An All-electric Bakery.

In this particular bakery, situate in a town south of London, steam injection is supplied to both ovens from a small electric pressure boiler fixed on the wall between the two ovens. This boiler is fitted with two 1-kW immersion heaters, and is fed with hot water from a 75-gallon electric storage tank fixed in the flour loft above the bakery. The dough mixer is electrically driven, as is also the dough divider (a machine which divides the dough into portions of equal weight, these being conveyed on an endless belt to the preparing table, where they are moulded preparatory to being placed in the ovens). Finally, for those who prefer it, a certain quantity of bread is passed through a bread wrapping machine, the waxed paper being heated by electricity as it passes through. Thus one can say that from start to finish in a bakery of this description electricity plays an all-important part in the production of the loaf as delivered to the consumer.

Fig. 3 illustrates a similar electric bakery in the north of England, which also has its electrically equipped steam injection, dough mixer, tempering tank, and radiator for the flour storeroom.

Apart from the elimination of dirt and dust in the bakery, valuable space is saved by the use of the electric oven, as no provision is necessary for fuel storage or ashes. Flues not being required, the electric oven may be placed in any position, and when alterations are being made it can be moved to a more convenient position without involving structural alterations.

Thermostatic control is an advantage only for very special work or cake baking when the oven has to be left for fairly long periods; for bread baking it is unnecessary. A far more useful instrument is the time switch, which often allows the baker an extra hour in bed, since his ovens will be ready for use without the need for rising early to fire them up.

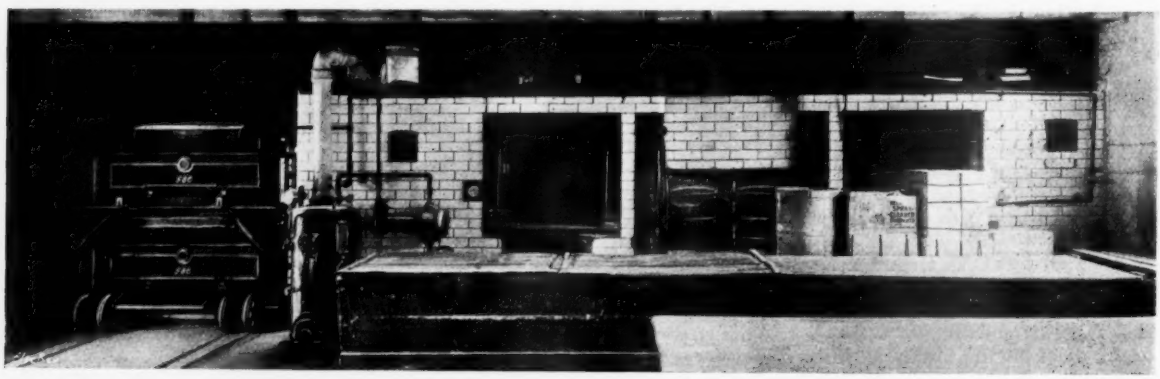


Fig. 4.—Ancient and Modern; a Contrast in Floor Space Occupied.

Contractors' Tools.

The author shows how money and trouble may be saved by a proper record system and mentions the possibility of hiring heavy or expensive equipment locally.

By H. R. TAUNTON.

"TOOLS"—by which is meant the larger tools which are the property of the employer, as distinguished from those in the electrician's kit, together with instruments, tackle, and other special apparatus required from time to time on diverse contracts—"tools" have an uncomfortable place in an electrical contractor's organisation something like that of "empties." Both figure in suppliers' invoices but not in customers' accounts—there is no making a profit out of them—and they spend most of their time wandering at large, at the mercy of workmen. And both are apt to disappear mysteriously. Tools and their owners are soon parted. Without a strict system of recording their whereabouts to ensure their eventual return to the right quarter losses on their account—as on empties—may in the course of the year amount sometimes to a large, and always to an irritating, total.

The commonest tools supplied by the employer are stocks and guides, for conduit (or gas) threads of various sizes. Dies are consumable tools, and therefore do not come under present discussion. A contractor in a reasonable way of business, whose standard system is heavy gauge conduit, may have five or six dozen sets of stocks in store or circulation, representing alone a considerable capital outlay, well worth a little trouble to preserve intact. Other common tools usually supplied by the employer are pipe-vices, portable benches, machine and electric drills, draw-tongs, cramps, blow-lamps, and such special or expensive tools as stencils, Cooke's cutters, expanding bits, &c., the character and quantity varying with the character and size of the business.

Tackle varies in the same way. The assortment required by a firm which goes in for street lighting or overhead construction will naturally be more extensive than that required for domestic installation work. Ladders, steps, trestles and planks are the commoner items; but derricks, winches and hoisting gear, and such sundries as watchman's braziers and hurricane lamps may be essential equipment to some firms.

All this means bulk, not usually to be accommodated in the general store, and its permanent possession implies the occupation of a yard or shed. To obtain a convenient store is often difficult enough in London and other large cities. To obtain further the necessary space for a lot of tackle is often impossible at a reasonable rental. The alternative is to hire tackle as and where it is wanted, from builders, builders' merchants, or firms which specialise in this hiring service. Even those contractors who own a normal range of tackle are obliged at times to hire special apparatus such as, *e.g.*, a tower wagon; and again, it often pays them on distant jobs to hire tackle locally rather than pay heavy railway carriage on their own.

Indeed, taking into consideration the rental and other standing charges of a yard or shed, cost of carriage and cartage, and interest and depreciation on capital outlay, it is probable that many firms who own their own tackle would find on analysis that it would be an economy to get rid of it and rely solely on hiring. Terms, particularly to regular customers, are usually reasonable enough. To avoid waste of hiring money, however, intelligent co-operation on the part of the foremen is essential. Unless they are checked they are apt to order all the tackle they want long before they can fully utilise it, and to hang on to it until the last lamp is inserted in the last holder. Incidentally, on long-drawn-out contracts it will often pay to buy tackle outright,

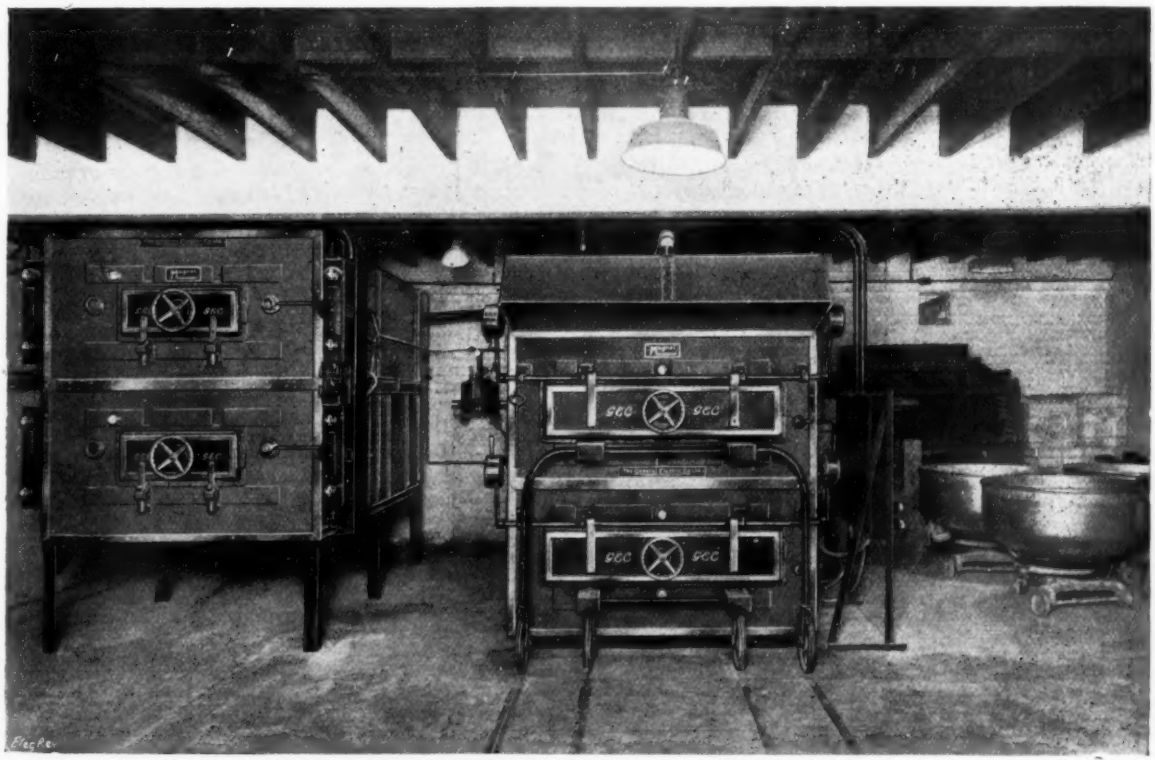


Fig. 5.—The Bakery Illustrated in Fig. 4 as it Appears To-day.

either new or secondhand, and to dispose of it at the end of the job.

Hiring is also necessary at times to avoid unremunerative capital expenditure on special instruments rarely needed, such as a recording voltmeter; but most contractors will own at least one testing set or megger. It, and any other instruments carried as permanent plant, should receive the special treatment called for by their delicacy, to say nothing of their cost. They are apt to become temperamental if they are slammed about by a callous stores-boy, like so many c.i. junction boxes. They are best kept in a lock-up cupboard when not in use; and if it is possible to avoid it, they should not be sent unattended by train. They nearly always suffer in transit. Better to borrow a megger locally; and usually there is no difficulty in doing so at a nominal figure.

All tools, instruments and tackle should be stamped, labelled, branded or in some way permanently and unalterably marked as the property of the firm. It is some check, though not always effective, on the "borrowing" propensities of the acquisitive not only among the firm's own men, who are often strangers temporarily engaged, but among other tradesmen on contract buildings. For the rest, reliance can only be placed on the vigilance of the foreman, supplemented by systematic records.

Every article should also bear a distinguishing serial number. A special book—a small octavo with single cash ruling will do—should be kept in the stores, and in it recorded a complete list of all tools, &c., each with its distinguishing number, full description, date of purchase and original cost. New items are added as bought, and items lost or become unusable are of course cancelled. For accountancy purposes the total cost shown is subject to annual depreciation, but for working purposes the original cost may be more conveniently used in booking the items in and out.

The actual recording of the movements of tools may be done in either of two ways:—

(1) Tools may be booked out against requisition like any other article sent from stock, not necessarily on a separate delivery note. From the office copy they will then be entered in the cost ledger (at their full nominal value) to be credited on return. If they are lost the cost of the job suffers accordingly.

To ensure that the whereabouts of each is readily traceable a collected record is necessary in the shape of a card index or loose-leaf notebook. Each item has its separate card or leaf bearing the same particulars as in the summary tool list. The remainder of the card is ruled, front and back, with two plain columns repeated *ad lib*. In one is entered the date the tool is sent out, and in the other, the number of the appropriate delivery note. On return to store the entry is cancelled.

In this way the whereabouts of any particular tool is readily ascertained, without having to search through delivery notes or cost ledger accounts. No uncancelled entry on its card means that it is—or should be—in the store.

(2) The suggested index may be omitted if a separate delivery note book is reserved for tools only. This will save some clerical work, and it will show simply enough where any tool that is out may be looked for, but, except by elimination, it will not show what tools remain in store.

Even with the first system it is desirable to keep a separate delivery note book for tools, or at least to advise them on separate delivery notes, not mixed up with other goods. These notes can then be rubber-stamped ("TOOLS. Received by ....") and the foreman instructed to receipt them and return them promptly to the office. He will thus be impressed by his responsibility for the safe return of the tools he is lent, knowing that at the end of the job a batch of receipted notes will be produced against him, all to be accounted for. It will make him careful, too, to see that he is credited with any tool transferred from his job to another without passing through the store. It is a common practice for a man sent out on a job to pick up, say, a set of stocks and dies from some contract where he knows or has been told there is a spare set; and he in his turn may pass it on to a third man, without anyone taking the trouble to record its wanderings, which end in confusion and often in complete oblivion.

The working of the normal routine described should be checked at intervals (say every three or four months) by an independent census, all foremen making a return of the various tools on their respective jobs. Added to those still in store, the resultant figures should agree with the current records. Periodically, too, tools and tackle should be overhauled, cleaned and repaired, missing parts replaced, and the hopelessly damaged items scrapped.

Nothing that has been said here, of course, applies to consumable tools such as bits, files, hacksaw blades and the like. Their cost is a direct charge against the jobs on which they are used, and is to be booked to the appropriate cost ledger accounts in the same way as other material used on them.

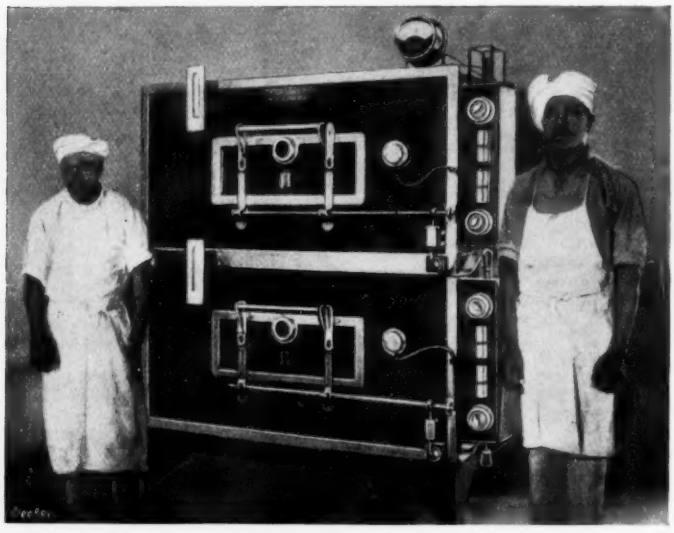


Fig. 6.—An Electric Bread Oven in South Africa.

Electrical Prospecting.

Prof. Henry Briggs, Hood Professor of Mining, in lecturing on "The Elements of Geophysical Surveying" at Edinburgh University, continued his description of electrical methods of prospecting, the rudiments of which had been given in a previous lecture. He referred to the variety and wide application of those methods, which were now being used in prospecting for ore, in tracing faults, and as auxiliary to other systems in elucidating geological structure.

During 1930 electrical surveys for the latter purpose had been carried out over large areas in Rumania, while electrical surveying had recently been responsible for locating ore bodies in regions as far apart as Sweden, Yugo-Slavia, Cyprus, Tunis, Dutch East Indies, South Africa, America, and Japan.

It had been found, said the lecturer, that the electrical resistance of coal was affected by the amount of gas it contained. It was just possible, therefore, that in the future these methods might be applied in certain coal mines that were prone to outbursts of gas to the problem of locating zones in the coal which were dangerous in that respect.

Domestic Apparatus Developments.

Constructional Features of Some Recently Introduced Equipment.

AS we imply in our leading article of this issue, a brief survey of the cooking and heating apparatus displayed this year at the British Industries Fair, Birmingham, leaves one with the impression that a sound position generally has been reached in the production of this class of equipment. The following notes refer to a few of the outstanding items which attracted our interest.

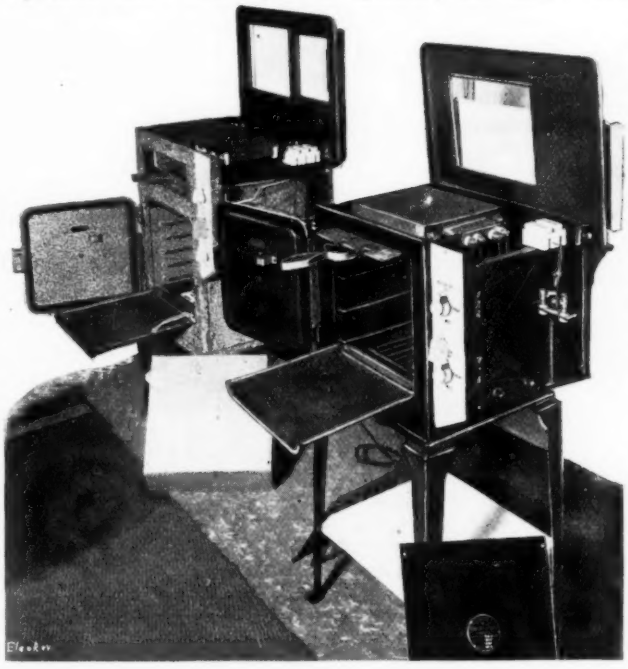


Fig. 1.—Constructional Features of Modern Cookers.

To deal with cookers first, the most revolutionary introduction is undoubtedly the thermal-storage cooker exhibited by the GENERAL ELECTRIC CO., LTD., an external view of which appeared in our last issue, p. 350. In this the thermal-storage medium is a block of cast-iron, the upper surface of which projects through a special hob of metallised heat-resisting material and serves as a hot-plate. The iron block is served by a 500-W element, and is, of course, well heat insulated. A system of mechanical shutters at the top of the oven, operated by a rod projecting through the side wall, permits heat to be directed into the oven at will from the bottom of the block. There is also a booster element of 500 W capacity in the bottom of the oven, and both elements are controlled by a change-over switch, so that there is always one element "on." A warming cupboard is positioned under the oven and receives heat from the bottom element. Fig. 2 is a graph of the storage-block temperatures taken over a test period with the cooker in operation for the normal domestic requirements of a day.

On the stand of Messrs. CHESTERTON, JONES AND CO., LTD., were seen two cookers, a special feature of which is a patented tray fitted under the hob, which is entirely free of any wiring on the top surface. On the right, under the hob, are mounted four fuses controlling the various circuits, and the opening in the casting is made of sufficient size to allow of any particular make of fuse required by the supply engineer. A door is fitted to the grill chamber, so that the latter can be used as a hot cupboard. All the elements are controlled by "Hart" reciprocating switches, and an interlocking switch plug is fitted as standard. The oven is loaded at 2,400 W, and it has a removable interior. The whole cooker is enamelled almost entirely throughout, including the walls containing the lagging, while the parts not enamelled are sherardised to prevent rust. The boiling plates and grill are of the plug-in type, and provision is made for side or bottom heating, as required, by means of an "all-round" bus-bar arrangement.

An interesting point about a range of new cookers introduced by CREDENDA CONDUITS CO., LTD., is the manner in which the oven elements serve as runners for the shelves. The elements are housed in the cooking space, and each side one takes the form of a number of horizontal enclosed tubular heaters "barred" at the rear end and arranged as a plug-in unit. The shelves are double flanged, one each side of the runner, so that they are untiltable. The grill and boiling plates are also of the plug-in type.

"Baby"-type cookers are becoming popular; indeed, in many quarters they are regarded as sufficiently large to meet the ordinary requirements of four

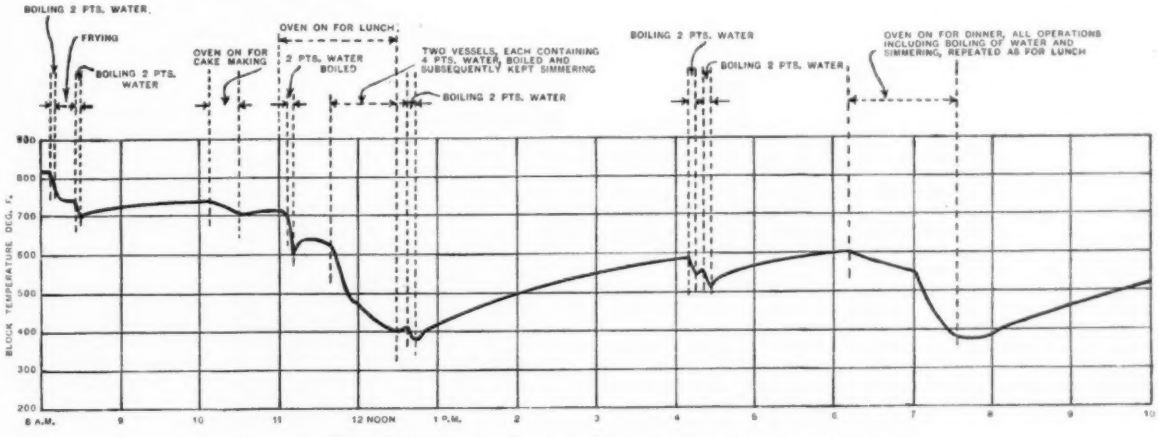


Fig. 2.—Thermal-storage Cooker Block Temperatures during Test.

persons. An excellent example of this class of apparatus is the "Tricity Tot" just introduced by the BRITISH ELECTRIC TRANSFORMER CO., LTD. When considering the design for this model the makers' idea was to produce an efficient cooker at the lowest possible price

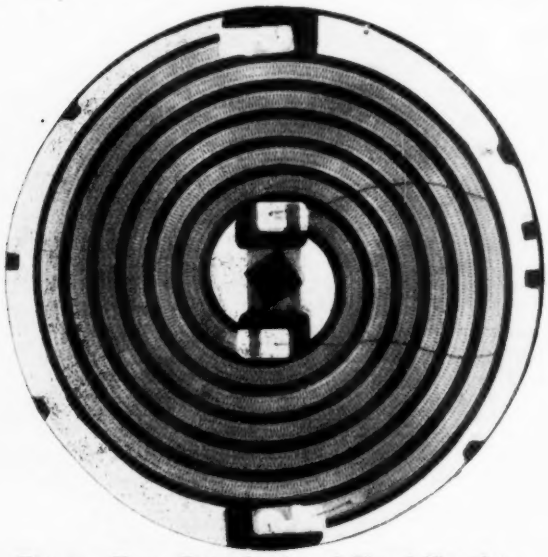


Fig. 3.—X-ray Reproduction of Closed Hot-plate.

to meet the requirements of the occupants of small flats and houses. It is claimed that the "Tot" will deal with meals for three people with ease, although, in actual dimensions, it is only slightly larger than the average "baby" cooker. It is constructed of sheet steel, which is treated with a primary coat of vitreous enamel, has a cast front, door and legs, and it embodies a useful pot rack at a suitable height above floor level. Two elements only are used, a combined grill and boiling plate of a new design, 9⅝ in. by 7⅞ in., loading 1,600 watts, and an oven element of the coil type; both are controlled by three-heat reciprocating switches. The grill element may also be used as an extra oven heater. The grilling actually is carried out inside the oven, and ample facilities are provided for allowing the grill pan position to be adjusted by lowering or raising it. Fig. 1 shows clearly the simple construction of this cooker, together with that also of the "Tricity Tweeny," a similar but slightly larger cooker which has been designed to serve for four persons. The total loading of the "Tot" is 2,600 W, and of the "Tweeny" 4,600 W. It was very interesting to see displayed on the G.E.C. stand progress parts, depicting for the first time the construction of the new hot-plate introduced a year or so ago by that concern. The essential parts are a top made from special heat-resisting iron, a nickel-chromium element, and a refractory filling. On the underside of the top are grooves which are first lined with the refractory. The spiral element is then put in position, and the heavy end leads are secured by insulating blocks. The grooves are next completely filled with the refractory, so as to embed the element. Before fitting a backplate, the hot-plate is fired at a high temperature. Fig. 3 is a reproduction from an X-ray photograph of a plate.

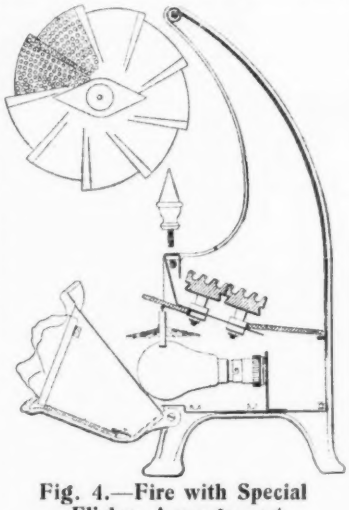


Fig. 4.—Fire with Special Flicker Arrangement.

Perhaps the most notable of the new introductions of water-heating equipment is a range of three heaters of three-, five-, and twelve-gallons capacities shown by WHITE TILE HEATERS, LTD. These have a particularly pleasing appearance, fig. 5, being rectangular in section and faced externally so as to represent white tiles. The copper tank is of similar shape, and each heater is fitted with either a "Bray" or a "Belling" element and a "Satchwell" thermostat. We understand, however, that the company is at present developing an element of its own design which will probably be embodied in the heaters in future.

A recent development of CARRON COMPANY, the "Blake" 2-kW fire, embodies a particularly realistic flicker, flame, and smoke effect by means of a special flicker arrangement, the construction of which, with that of the fire generally, is shown in fig. 4. A frame suspended over the lamp carries the rotor, a perforated aluminium stamping, fig. 4 inset, to which is attached a piece of magnetised steel, which has the effect, by a "damping" process, of varying the speed of rotation and so breaking any mechanical monotony. The hinged "basket" of the fire is released for lowering, as in the illustration, by removing the two screwed-on ornaments from the framework over the elements.

Another new fire which embodies a realistic coal-flame effect is the "Flicker" fire introduced by Messrs. BELLING & CO. In this a new kind of imitation fuel is used, and the "firebars" are set at an angle so as to ensure direct radiant heat to the upper part of the body, as well as to the feet. A further feature is provision for kettle boiling and bread toasting by means of a grid above the elements, while a flat top to the fire permits food to be kept warm.

A bathroom heater, 600 W, recently introduced by Messrs. CHESTERTON, JONES, LTD., is of the bowl-fire type, and is designed for suspension from the ceiling, so as to eliminate the risk associated with the use of some classes of apparatus in bathrooms. This heater is supplied in three types; one is combined with a lighting fitting, the chromium-plated or polished-copper bowl being suspended beneath by three chains; one without a light, but with a ceiling rose and chains; and one arranged to suspend from a fixed pendant.

One of the undesirable reflections of the conflicting designs of cooking apparatus is the large variety of cooker control equipment which is apparently necessary at the present time. Messrs. J. H. TUCKER AND CO., LTD., have just added a new control unit to their wide range, making about 24 models in all. This new unit is very compact, measuring overall 12 in. by 4 in. The c.i. case houses a 30-A switch, with the usual side-handle operation, a 10/15-A fuse, a 5-A three-pin plug, and a pilot lamp connected internally to one of the side walls. A bull's-eye lens in the cover coincides in position with the lamp inside.

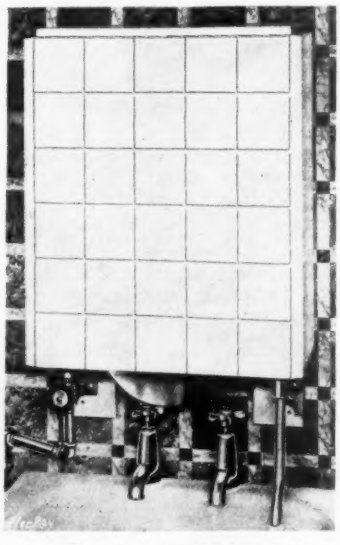


Fig. 5.—"Tile-faced" Water Heater.

Increasing attention is being given nowadays to the provision of special cooking utensils. A segment of such a utensil seen on the stand of Messrs. BUNCHER AND HASELER, LTD., illustrates the construction of "Perfectric" appliances, which have ¼-in. thick bottoms.

Small A.C. Motor Startors.

With a view to providing all the desirable operation and protection features at moderate cost the author suggests a modification of the simple switch-fuse.

By J. P. S. PILLANS, A.M.I.E.E., A.M.I.Mech.E.

IN view of the high degree of uniformity to which the greater part of a.c. apparatus has been brought, for example, the small 3-phase induction motor, it is surprising that there should be so little measure of agreement as to the minimum essentials of small direct-on-line type motor startors, taking into account the fact that every motor requires some form of starting device. The underlying cause, no doubt, is the diversity of features for protection or convenience which may be included, in addition to the simple switch which, in essence, is all that is necessary to cause rotation. These features impart a greater or less degree of protection for the motor against faults or misuse, and for the operator against accident, in addition to providing special operating facilities, such as remote control or "inching." The final cost of the apparatus being roughly proportional to the number of these features, we find that for a given small induction motor of, say, 2 h.p. costing, say, £7 a wide selection of starting gear may be obtained at prices ranging from £1 to £15. This state of affairs unquestionably bewilders the average non-technical user who all too frequently buys on price alone, and this reacts unfavourably on motor manufacturers, whose products may thus be blamed for failing to stand up to what may be grossly unfair conditions of use.

Is it not possible for this difficulty to be overcome by control-gear makers designing and standardising startors which include as cheaply and simply as possible all those features which experience has shown to be technically desirable and commercially in demand? The writer believes it is possible, and suggests that the following list represents the features in question:—

(1) Interlocked 3-pole isolator to ensure the safety of the operator and to comply with Home Office Regulation No. 11.

(2) Overload protection in each of the three phases for protection of the motor; as the neutral of the system is usually earthed, two overload releases are insufficient.

(3) Low-voltage release to prevent danger to operatives in the event of the accidental restarting of the motor following restoration after failure of the supply pressure.

(4) Push-button operation; this is greatly preferred by purchasers, and is a logical development of electrical usage.

(5) Elimination of single-phasing by ensuring that the operation of an overload release in one phase shall serve to open all three phases.

(6) Remote control; the startor should be suitable for automatic operation by a pressure regulator, float switch, &c., or for distant operation by means of a push button.

(7) "Inching"; a characteristic much in demand for machine tools, printing machines, &c.

(8) Ease of adjustment of overload setting to allow interchange of startor between motors of different sizes; a great facility in case of breakdown or change of motor.

(9) Ability to clear comparatively heavy short-circuit currents, such as may occur in practice.

(10) Simplicity of design to facilitate adjustment, cleaning, or repair; a matter of no great difficulty.

(11) Moderate price, not to exceed, say, £6 net.

Few dissentients will probably be found as to the desirability of the above features, but (9) and (10) may be thought to render them difficult of fulfilment.

With a view to finding a solution of the problem, consideration was given to the possibility of elaborating the simplest form of starting device hitherto used, namely, the 3-pole switch-fuse, costing about £1. From the point of view of overload protection, it is, of course, useless, although it is capable of dealing with short-circuit currents; since the starting current of a direct-on started induction motor momentarily exceeds four times the normal full-load current, a fuse capacity far beyond the proper overload setting is necessitated. By modifying the switch into a contactor, however, held closed by a voltage coil and operated by the direct pressure of a button, and adding a simple 3-pole interlocked isolator at the top of the switch case, requirements (1), (3) and (4) may be satisfied at no great expense, which is not materially increased if a second 3-pole spring-released contactor is interposed between the push botton and running contactor for the purpose of shunting the fuses as long as pressure on the "start" push botton is maintained. The addition of a "stop" push botton operating a normally closed switch connected in the hold-on coil circuit results in requirements (1), (2), (3), (4), (7), (8) and (9) being met, "inching" control (7) being inherent, since with the "stop" button pressed the motor will respond to the "slave" control of the "start" button which, if operated with a quick "jabbing" motion, will cause a slight movement of the rotor with each "jab."

Requirement (5) may be met in a simple manner by causing the rupture of any fuse mechanically to open a small auxiliary switch (normally closed when the fuse is under a slight tension) connected in series with the hold-on coil, which on being de-energised either by the opening of any auxiliary switch, the "stop" button, or by failure of the supply pressure, releases the three running contactors which are coupled together for the purpose, thus isolating the motor.

The arrangement can now be modified in order to provide remote control (6) in addition to local operation, and this may be done by dissociating the second or short-circuiting contactors from the running contactors, and providing a second pressure coil controlled by the "start" push button for their operation. The capacity of the running contactor coil is increased and the connections altered so that operation of the "start" or short-circuiting contactors will in turn electrically close the running contactors, which are self-closing and maintaining, in contra distinction to the "slave" operation of the starting contactors from the "start" push button.

It will be noticed that the whole of the above list of desirable features has been incorporated in the suggested startor without sacrificing simplicity at a cost not exceeding that laid down, including 30s. for the remote-control feature alone, which may be omitted. For the sake of completeness it should be mentioned that the suggested apparatus not only fulfils all the requirements, but is also a commercial proposition. It is not suggested that the same results cannot be obtained by other means, but the writer is of the opinion that all small a.c. motor startors should, at least, include full protection for the operator and machine, and that it would benefit the industry as a whole, and ultimately the purchaser, if without exception motor manufacturers and installation contractors would regard a startor affording complete protection as being an essential complement of every motor installed, and one that admits no alternative.

Earth Currents.

Tests Indicate that Small Currents in Cable Sheaths do not Necessarily Denote High-resistance Faults.

By R. N. PEGG, A.M.Inst.C.E., A.M.I.E.E.

IT was stated in an article which appeared last August in the ELECTRICAL REVIEW* that if a milliampere meter were placed in circuit with the isolated lead sheath of a section of main and "no deflection of the needle were observed, all would be well and good. If, on the other hand, a deflection of, say, 2 milliamperes were obtained," a high-resistance fault would be reported and eventually located by the method described. The writer's experience, on a network similar to that referred to, is that 2 milliamperes may be measured in the lead sheath of any such length of cable in *city areas*, whether the cable is alive or dead. For instance, the portion of a network shown in fig. 1 on which the test was taken involved about 2,500 yards of heavy 4-core mains laid direct and completely jointed, but not alive. Running parallel with it in the footway is an existing d.c. system, as in the case described in the previous article, together with Post Office pipes, a single-phase system in armoured cable laid direct, and occasionally gas and water pipes. The 4-core main has been laid clear of the other cables and, where the clearance is small, fire tiles are used as separators, so that to all intents and purposes the subsoil is the only connection between it and them.

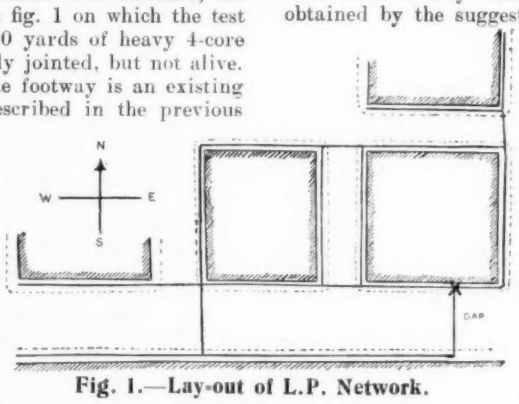


Fig. 1.—Lay-out of L.P. Network.

The lead sheath and armours are bonded throughout. A 1-inch gap was made in the lead at the position indicated. This position was not chosen for any other reason but that of convenience. On each side of the gap a copper clip made of 2 in. by 0.1 in. strip was plumbed on to the lead, and the ends of the strip connected to an ammeter shunt, using a moving-coil ammeter.

At 11.0 a.m. current across gap was 50 to 70 milliamperes, and the p.d. 9 millivolts max. At 3.0 p.m. the current across gap was 30 to 50 milliamperes, and the p.d. 7 millivolts max. In the above instance the values varied during the day, but in a different part of the district the values measured at 11.0 a.m. and 2.30 a.m. were identical, although there is no guarantee that they did not vary during that period. These tests were carried out on a section of heavy 4-core main, which was alive the circuit being identical with that illustrated in the article referred to, and the length from A to B was 100 yd., see fig. 2. They were taken in November, 1929, for another purpose, and were only concerned with potentials and currents from the lead sheath to an adjacent water main, but although no attempt was made to measure any current flowing in the lead sheath on this occasion, the difference in the p.d.'s to earth at each side of each gap make it a reasonable assumption that current would have been measured had the circuit been provided.

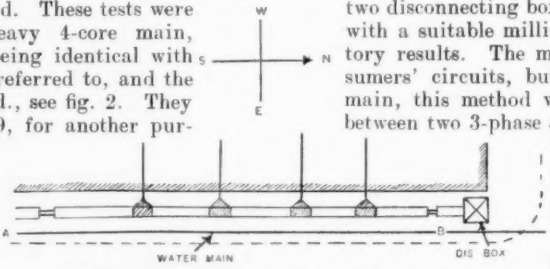


Fig. 2.—Section of Cable under Test.

At 11.0 a.m. gap A, north side	:	120 millivolts to water main.
,, ,, ,, south side	:	25 ,, ,,
Therefore across ,,	:	95 millivolts.
gap B, north side	:	60 millivolts to water main.
,, B, south side	:	130 ,, ,,
Therefore across gap B	:	70 millivolts.

At 2.30 a.m. the results were exactly similar, and in all cases the cable was negative to the water main, and the current direct. To prove that this current had no relation to the adjacent d.c. network, the earth potentials of the d.c. system were artificially altered without having any effect on the readings from the a.c. cable sheath, and finally at 2.30 a.m. the d.c. network was made dead for a few moments without effect on the voltmeter readings.

Without knowledge of these inherent currents in the sheath circuits, section by section, it would be impossible to base any reasoning on the small readings obtained by the suggested method. Moreover, as they vary from hour to hour, what value for any given section could be logged? Also, even were they of constant value, the labour in reading and recording them would be no mean item. Again, assume for a moment that there is a certain steady d.c. in the sheath of a length of cable, with a small high resistance fault in this length, the testing milliampere meter would read the sum of these two currents, but as the complete circuit is made up of a d.c. circuit in parallel with an a.c. circuit, both of whose electrical characteristics are unknown, how could the fault current value be identified?

It is a common experience in city areas when making a loop test to find a varying earth potential in the millivolt range and, from a given point, polarity will often reverse more or less regularly each day.

It has been suggested to the writer that some of these small earth currents may be due to adjacent systems, and there appears to be every reason for this assumption; in any case, they are present and form a complication which cannot be ignored.

The present method of periodical earth testing, by which faults of five to ten amperes can be located between two disconnecting boxes or to the particular service with a suitable millivoltmeter, give quite satisfactory results. The majority of faults are on consumers' circuits, but, even if a fault is on the main, this method will give the section of main between two 3-phase services or at the most a span of four houses, supposing each has a single-phase service from a 3-phase, 4-wire main.

It is true that these are not high-resistance faults, but does past experience justify the locating of high-resistance faults? The writer does not think that it does. Assuming that the method will locate such faults, the number to be dealt with on the basis of an i.r. of 46,000 ohms, which includes a length of main and several services, some of which may supply large premises, each with hundreds of points, would keep a staff very fully engaged with the possibility of the fault fading away as sections were eliminated.

In conclusion, the writer would stress again that he is referring to city areas and would be interested to learn of any tests that have been carried out in an urban district on an isolated plant.

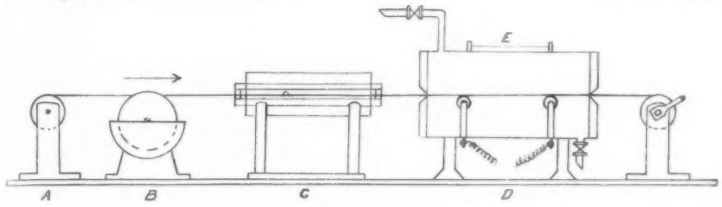
* "High-resistance Cable Faults," by T. G. Partridge, A.M.I.E.E. (ELECTRICAL REVIEW, August 22nd, 1930).

Gasfilled Lamps.

Some Notes on the Chemical Processes Involved in their Manufacture.

By A. E. WILLIAMS, F.C.S.

THE practical efficiency of a lamp is the number of watts consumed by the lamp per mean horizontal candle power. In the days of carbon-filament lamps the efficiency was between 3 and 4, and, at the present time, the efficiency of a metal-filament vacuum lamp varies from 0.9 to 1.3 watts per m.h.c.p.; the greater efficiency being obtained in the larger sizes of lamps, *i.e.*, 100-500 watts.



E = mica window.

Fig. 1.—Arrangement of "Gettering" Apparatus.

For the gasfilled lamp the efficiency ranges from 0.5 to 0.9, the higher efficiency being attained in the larger sizes. From the fact that the larger sizes of gasfilled lamps consume only 0.5 watt per m.h.c.p., the term "half-watt lamp" was derived. This term is somewhat loosely applied to all gasfilled lamps and, in some cases, to vacuum lamps provided with a concentrated helix filament as used in gasfilled lamps.

Gasfilled lamps were first manufactured in 1913. In general, the effects of the gas in the lamp are: (1) to reduce the rate of evaporation of the filament, (2) to cool the filament, (3) to convey any evaporated material, by the convection currents set up, to the top of the bulb where it has least effect on the light emitted by the filament.

As the rate of evaporation is reduced by the presence of the gas, it is possible to operate the filament at a higher temperature, *viz.*, about 2,400° C., than would be practicable in a vacuum lamp, and thus increase the efficiency.

So that the gas shall not exert an undue cooling effect on the filament, the latter is wound into a close coil or helix. The mandrel upon which the tungsten wire is coiled is of iron or brass, and, after a suitable length of coil has been wound, the mandrel is partially dissolved in hydrochloric acid, thus liberating the tungsten coil, which is then thoroughly washed and dried before being weighed out for filament making.

Argon Gas.

The argon for lamp-filling is produced at the Wembley factory of the British Oxygen Co., Ltd., from liquid air. Liquid air is rectified in the rectification plant illustrated in fig. 2, from which oxygen containing 5 per cent. of argon is withdrawn and submitted to further rectification. The argon so obtained is practically free from nitrogen, but contains a small amount of oxygen, which is then almost entirely removed by chemical methods before the gas is compressed into cylinders.

At the lamp factory the argon is further treated to remove residual oxygen. The gas from the cylinder is passed through sulphuric acid, then through a column of soda-lime, and finally through steel tubes containing copper and magnesium turnings, heated by gas burners. From the purifiers the argon is passed to a galvanised iron holder for storage before admission to the lamps. The latter, when rendered sufficiently vacuous, are filled as illustrated in fig. 4, in which the following connections are shown: C, to rheostat; D, to argon gas holder; E, to rough vacuum pump; F, to Gaede pump; and G, to gauge. H is a rubber-lined brass tube.

By raising the temperature of the lamps to 350° C. when filling and sealing off at this temperature, the pressure of the gas entering the lamps may conveniently be maintained higher than atmospheric, *viz.*, about 866 mm. of mercury.

Gas Pressure in the Lamp.

The gas pressure in the lamps, when cold, is approximately half atmospheric or 380 mm. mercury; this pressure rises to about one atmosphere when the lamps are in normal use. Although the gas pressure in the lamp will vary slightly with the temperature of its immediately surrounding atmosphere, the temperature of the gas inside the lamp, when the latter is in use, is approximately 250-300° C.

If we assume an average temperature of 270° C., and P represents the pressure of the gas in the lamp when normally working, then $P/380 = 543$ deg. A./273 deg. A. Therefore $P = 756$ mm. mercury or nearly atmospheric pressure.

A pressure greater than this would be disadvantageous, as it would increase the possibility of leakage through the foot of the lamp where the leading-in wires enter; and there would also be danger of the lamp bursting owing to the fragile nature of the bulb.

Chemical "Getters."

Certain chemical substances, known to the industry as "getters," chiefly halogen and thorium compounds,

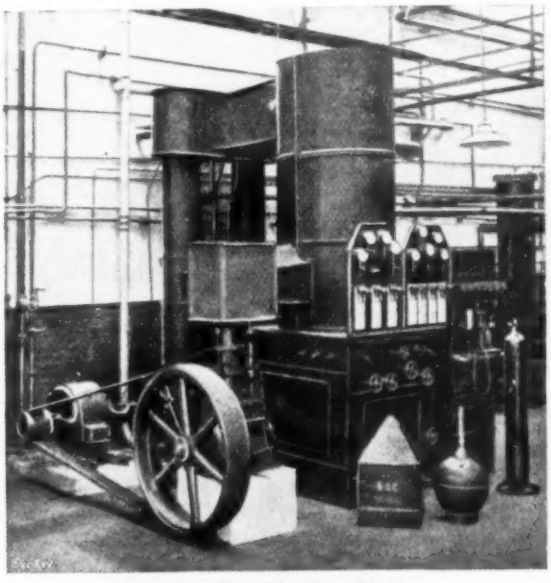


Fig. 2.—Rectification Plant.

are often used, with advantage, on the tungsten filament.

The problem ever before the lamp-maker is how to increase the "life" of the lamp, which depends on how long the lamp can be normally run without excessive evaporation of tungsten. The life of a lamp is taken to be the period required for the m.h.c.p. to fall by 20 per cent. of its initial rated value; for a good lamp this is usually well over 1,000 hours.

Apparently the "getters" react in several ways:

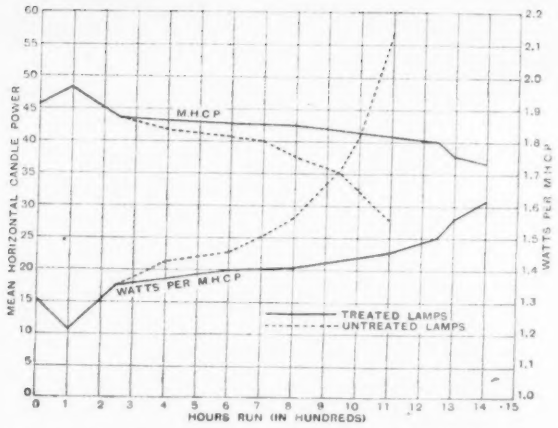


Fig. 3.—Performance of Treated and Untreated Lamps.

(1) with the evaporated tungsten from the filament to form a transparent tungsten compound on the bulb, instead of the dense black tungsten deposit; (2) form compounds with the evaporated tungsten, which are, in turn, decomposed by the intense heat, the nascent tungsten being again deposited on the filament; (3) control recrystallisation changes in the tungsten which must necessarily take place at the temperature of operation.

If the "getter" functioned as in (1) only, it would have little value, as evaporation of tungsten involves a reduced filament diameter, with consequent increased resistance to the current passing, and increased resistance means a weaker current, with a concomitant feebler incandescence. The ideal "getter" would be one functioning as in (2), but, in addition to this, the "getter" usually deposits a thin, practically invisible film on the bulb.

"Getters" reacting under (3) often include thorium compounds, which prevent excessive deformation of the filament due to recrystallisation changes in the tungsten when the lamp is in operation. Without this addition the filament quickly develops an irregular surface due to crystal rearrangement. Some parts of the filament become considerably reduced in diameter, which leads to over-heating at these points and eventual fusing.

"Getters" are applied to the tungsten wire, before being cut up for filaments, by a "gettering" apparatus, one type of which is shown in fig. 1. The tungsten wire is drawn slowly from the spool A on to the grooved brass wheel B, which rotates in a bronze vessel containing the chemical, where it receives an uniform coating of the "getter." The wire then passes through a tubular electric heater C, and thence through the hydrogen chamber D where, by means of two brass roller contacts forming the poles from a rheostat, sufficient current is passed through the wire to attach the chemical firmly to the tungsten. From the hydrogen chamber, which is replenished at intervals from a cylinder of the gas, the wire is wound on to another spool ready for filament making.

In tests carried out by the writer, six vacuum lamps, 210 volts, 60 watts, were "gettered," and six of the same type were made up without the "getter." The chemical employed was a suspension of precipitated calcium fluoride, CaF_2 and cryolite, $AlF_3.3NaF$, in alcohol.

The lamps were placed together on life test and supplied with a.c. at 210 volts, their average performance being illustrated by fig. 3.

After 250 hours the c.p. of the "gettered" lamps remained fairly constant up to 1,250 hours, after which it declined until at 1,400 hours it had fallen to 37, an efficiency of 1.62 watts per c.p. The performance of the untreated lamp, shown by dotted lines in fig. 3, was not so good. At 800 hours the c.p. had fallen to 38, and thereafter fell rapidly to 28 at 1,100 hours, an efficiency of 2.14.

Standardisation.

Its Economic Effect on Engineering Progress.

(Extracts from a paper read before the ROYAL SOCIETY OF ARTS.*)*

AT a recent meeting at which Mr. Ll. B. Atkinson, M.I.E.E., presided an endeavour was made by Mr. C. le Maistre, C.B.E., F.C.G.I., director of the British Engineering Standards Association, to indicate the contribution which standardisation can make towards the solution of the problem of industrial revivification by the introduction of greater economy in manufacture and distribution. There is not any single remedy for trade depression, in this or in any other country, and the author does not claim for standardisation that it is in any way a panacea for all evils. It is an undoubted fact, however, that when properly organised it is a most important factor in diminishing the excessive ups and downs from which industry suffers. It is one of the really remarkable developments of this century, in that it eliminates much of the avoidable waste and promotes greater efficiency in industry.

The author points out that manufacturers all have a tendency to produce too much, and in too great a variety. When purchasing one likes, it is true, to have some choice, but not such a choice as to confuse. A recent investigation into three trades in the United States of America showed that about 75 per cent. of the sales were drawn from about 20 per cent. of the variety of goods manufactured; in other words, some four-fifths of the varieties of goods went to supply only one quarter of the sales.

So far the main efforts of standardisation have been directed towards the co-ordination of the requirements of producers and users, through the setting up of standards of quality and performance, so simplifying production and distribution and thus bringing about more equity in the purchase and sale of industrial materials and apparatus. This has really been a process of unifying, simplifying, and modifying the requirements of industry by agreement between all concerned, adopting what is economically best in present practice, without any attempt to set up an ideal which might be too costly for industry to adopt.

The author is inclined to think that in this country the majority of people have only a very foggy notion of what standardisation really means, and have no conception of the principles upon which it is carried out in this country. The term itself is rather an unfortunate one, although we cannot find a better. It seems to lead to the idea, very prevalent among many people, that it stultifies progress by setting up unalterable standards, but nothing is further from the facts. Without the necessary interchangeability we should be

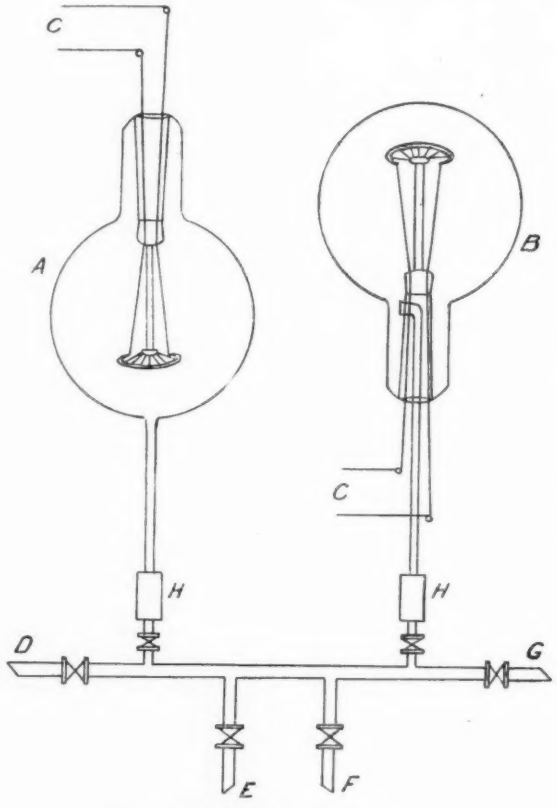


Fig. 4.—Method of Filling Lamps.

debarred from using many of the appliances we now so universally enjoy. The curious thing is that the ultimate user hardly notices the standardisation. He takes it for granted, enjoying the benefits without realising the enormous amount of labour involved in making them possible.

Now one may ask what benefit is all this to industry; how can it help our present trade depression? A British standard acceptable to the users of the finished article will enable manufacturers to keep their men in constant employment, being certain that their stocks will be used when the orders come in again; that is to say, such a standard is stabilising employment. The use of British standard specifications, by saving waste of time and material, increases the competitive power of manufacturers in the open markets, enabling them to secure more orders, and so they tend to increase rather than to diminish the number of people employed. This shows how misconceived is the idea that industrial standardisation causes unemployment, possibly due to confusion between rationalisation and standardisation. The latter, when surrounded with all the necessary safeguards of review and revision, is one of the most progressive co-operative and constructive movements it is possible to imagine, but there are still certain critics who, not being familiar with the procedure, fear that standardisation is going too far and that unless a halt is called the country will be over standardised. There is, certainly, always this danger unless the movement is most carefully watched and wisely guided.

People sometimes think that American standardisation is the ideal, but it must be remembered that America is a Commonwealth of Nations trading freely within itself with an almost illimitable home market. Great Britain exports to many different countries, each of which has very different requirements, often competing against low-paid foreign labour. We do not all of us want to live in the same sort of houses all filled with furniture of identical pattern, nor to wear the same sort of clothes, or boots of one type, but we do want to avoid misunderstandings in trade, to speak the same industrial language, to save avoidable waste, and to bring about fair dealings. Whilst it would be impossible in this country to adopt wholesale the American plan of reducing to the minimum the number of varieties of patterns for one and the same purpose, the pressure of economic events makes it essential that every branch of industry in this country should effect economies, and co-operate to simplify and unify their requirements.

Boiler Firing.

A discourse on the relative merits of the hand and automatic systems of combustion control.

(Extracts from a paper read before the ELECTRICAL POWER ENGINEERS' ASSOCIATION.)

THE paper dealing with the automatic control of boiler plant, by MESSRS. W. G. THOMAS and A. BROOKES, that was read before the London Technical Group of the above-named Association recently was chiefly concerned with the Bailey automatic combustion control system, which was first introduced into America 14 or 15 years ago and has been adopted in a few large power stations in this country.

The authors pointed out that, relatively to certain other countries, very little had been done in Great Britain with automatic combustion control, because some engineers had considered that it could only be utilised with large steaming units. They endeavoured, however, to make out a case for its application to smaller equipments, whilst stating that the Bailey system was intended for the larger size of boiler, for which its cost could be more easily justified. Instances were quoted in which the installation of automatic control had tended to reduce the cost of maintenance of boilers and furnaces, due to the steady rate at which fuel and air were sent to the furnace.

The Barton (Manchester), Leicester, and Leeds power stations were the first to adopt the Bailey automatic control system in this country, and it was interesting to note that the system was originally designed for working with pulverised fuel. It was an electrically operated system, and had a master contactor mounted on a separate panel; the function of this master contactor was to maintain the heat balance in the boiler plant by making the necessary adjustments to fuel, induced and forced draught simultaneously as required. The process was necessarily complicated, and, from the point of view of cost alone, somewhat expensive, but it claimed to possess some special refinements which outweighed other points.

Mr. S. B. Jackson (Central Electricity Board) said that the expense of installing the automatic plant, and the increased maintenance charges which it involved, did not appear to be justified, having regard to the very high boiler-house efficiencies obtainable with ordinary hand-operated plant. He mentioned one British station with a boiler-house thermal efficiency averaging from 85 to 86 per cent. with hand operation, and added that the certified figures relating to the Barton (Manchester) power station seemed to be excellent. There seemed to be quite a divergence in the manner of specifying boiler-house thermal efficiencies, and he urged that, in order to enable proper comparisons to be made, there should be a generally-accepted definition of "boiler-house efficiency." Mr. Jackson also asked how the automatic system of control dealt with large variations of load; there might be several power stations operating in parallel, and, due to the failure of, say, an inter-connector, one of those stations might have an extra load of 10,000 or 15,000 kW put on to it—indeed, in the future, as the grid sytem developed, the extra load might be 100,000 kW—would the plant be able to sustain such very severe conditions? With regard to pressure regulation, he mentioned a British hand-operated station in respect of which the line on the diagram was practically straight, and said that in that case there could be very little room for improvement.

Mr. Allsopp asked whether the cost of operation and the number of stokers would be reduced with automatic control. Would the fires need inspection from time to time, as with ordinary hand operation? When retort-type stokers were used, he supposed that the movements of sheers, pushers, and so on, would need to be looked after in the same way as in a hand-operated station, so that apparently there would be no reduction of labour in that respect.

Mr. W. Wilde questioned whether the alleged conservatism of British engineers with regard to automatic combustion control was due necessarily to lack of energy and foresight, and suggested that perhaps such control had not appealed to them as a financial proposition. Judging by reports of the National Electric Light Association, many operating engineers were not in favour of automatic combustion control. The American efficiency figures were beyond his belief, although the calculations might be made on bases other than those used in this country.

Mr. Walters presumed that as the calorific value of the coal changed, it would be necessary to re-set the apparatus; how was the apparatus re-set, how much time was occupied in re-setting it, and what class of employé must be available to do it?

Mr. Thomas, replying, emphasised that the Americans had had opportunities which engineers in this country had not enjoyed. The loads in America had increased very considerably, and very large stations were in operation; for the past 10 or 15 years they had been operating boilers delivering 150,000 lb. of steam per hour. Efficiencies of 90 per cent. were being obtained in this country with powdered-coal plant, and with stoker plant in daily operation efficiencies of over 84 and 85 per cent. were being obtained. The 90 per cent. efficiency in America had been obtained on test. If one asked in an English station what results were obtained, one would be told that they were consuming 1.4 lb. of coal per kWh, whereas what one really wanted to know was the number of B.th.u.'s consumed. With regard to the time lag of the instruments, the control drives would pick up from zero to maximum in about 3½ minutes, certainly not more than four minutes. In a station such as that at Battersea, where the maximum evaporation was to be 400,000 lb. per hour, the control would not operate from minimum to maximum, but would probably come into operation when the boiler was producing about 80,000 lb. per hour, and the output from that point up to 400,000 lb. per hour would be controlled automatically. That change would be made in 2½ minutes, and the control apparatus could do it, provided the boiler could take the coal and air given to it. In the Vitry (Paris) plant, which comprised six boilers of about 250,000 lb. per hour capacity, the plant had to take a swing of roughly 200,000 lb. in 1 to 9 minutes.

Mr. Jackson said that Mr. Thomas had stated that the Bailey meter was used at Barton, but he had not said that the high efficiency obtained there was due to automatic control. The question really was, what increase of efficiency would result from the use of automatic control?

Mr. Thomas said that, if the efficiency with hand operation was given as 86 per cent., he would expect an improvement of at least 1 per cent. with the automatic controller. The economy to be obtained by such an improvement, having regard to the coal consumption at Barton, would be such that in a year the plant would almost pay for itself.

Mr. Brookes, replying to the question as to the labour employed in a boiler house with automatic control, instanced a station in the U.S.A. in which six boilers were used, four being controlled automatically. One man, who was not a stoker, but an electrician, devoted one day to the Bailey control equipment of each boiler, going from one boiler to the next from day to day, not because repair was necessary, but in order to ensure that the apparatus was maintained in good condition; if anything went wrong with the equipment, operators were called in from outside to work the boilers by hand. There was a definite saving in labour to be effected by using automatic control. With regard to grate conditions and variations of the nature of the fuel used, he pointed out that the quantity of air required per 10,000 B.th.u. was an approximately constant figure for all commercial fuels, and if the coal were burned efficiently the heat would be reflected on the steam-flow record. He agreed that it was difficult to maintain grate conditions consistently, but if one were spending a good deal of money on the provision of automatic control, surely it was worth while spending a little more also on the method of feeding the coal on to the grate.

Reviews.

Modern Radio Communication. By J. H. REYNER, B.Sc., A.C.G.I., D.I.C., A.M.I.E.E., M.Inst.R.E. Third edition. Pp. xi+259; figs. 121. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

The second edition of this book appeared in 1925 so that a good deal of new matter has been introduced in this third edition to cover developments during the last five years. The book is intended to explain the theory of radio communication, and to indicate how such theory is applied in practice. It covers the syllabus of the City and Guilds Examination, and is suitable as an auxiliary textbook for candidates studying for the Postmaster-General's Certificate. Chapters marked with an asterik and portions in small print can be omitted if the Grade I City and Guilds Examination only is being taken. An elementary knowledge of mathematics and of the principles of electricity and magnetism is assumed. The first quarter of the book is devoted to the elementary theory of alternating currents as applied to radio circuits, the remainder to radio-telegraphy, with the exception of seven pages on radio-telephony. Numerical examples, with answers, are given for each chapter.

In a small book of this sort the difficulty is to know what can best be omitted as the field is so wide and the space is so limited, and we think that in this respect Mr. Reyner has been very successful. His explanations are clear and concise, and the matter is well arranged. It is, in fact, a good summary of the fundamental principles underlying modern practice, and the author rightly omits all mention of methods and apparatus which are now obsolete.

There are still a few statements which should have been modified in this edition, *e.g.*, "Transatlantic work is done on wavelengths of from 10,000 to 25,000 metres," and "the 250-kW arcs in use at the Leafield wireless station." The section on call devices too is so out of date as to be quite misleading. On the whole, however, the matter in the book is well up to date, and the general production is, as before, first class.

Alternating Currents for Technical Students. By C. C. BISHOP. Pp. viii+317; figs. 338. London: Macmillan and Co., Ltd. Price 8s. 6d. net.

This book, by an American author, is intended primarily for the use of those students and others who, whilst being familiar only with direct-current theory find it necessary to become acquainted with a.c. theory and apparatus. We suppose there must be still many such students—and others—or the author would not have written this book for their consumption, but, frankly, we find it a little difficult to assign a definite niche to the work. It seems to us to come within the unfortunate category of being "neither fish nor fowl, nor good red herring," which is regrettable because the author evidently could produce one or more volumes which would attract a much larger number of readers. The real trouble is that an endeavour has been made to cover too wide a field, with the result that the treatment as a whole is distinctly sketchy. In a matter of thirteen chapters the author deals with the following subjects in the order stated. Alternating currents, alternators, inductance, capacity, series circuits, parallel circuits, vectors, transformers, asynchronous motors, synchronous motors and rotary convertors, other a.c. apparatus (meters, rectifiers, lightning arrestors, induction regulators, reactors and relays), practical tests and measurements (machines, circuits and transformers) and, finally, trigonometry useful in solving vector problems. With such a comprehensive syllabus to work to within the covers of a single volume it is not surprising that the author has fallen between the stools of inadequate treatment and indifferent conception. In our opinion there are far too many books of the type, which purports to survey the field of alternating currents and a.c. apparatus in an elementary or introductory manner, and unless new methods of presentation are adopted there seems to be no need to add to them. While we sympathise with the author's aims, we are afraid the tangible result is not a very happy one. he would have done much better, we think, to have produced two separate volumes, one on a.c. theory and circuits and the other dealing with plant and apparatus.

Engineering Economics. By T. H. BURNHAM. Second edition. Pp. xv+376; figs. 12. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d. net.

The first edition of this book was reviewed in these pages at some length in our issue of August 2nd, 1929. The changes in the present edition comprise an extension in length of fifty pages, chiefly in the form of paragraphs added to the previous matter, coupled with a certain amount of rearrangement. In particular the three chapters on works organisation, production, and costing have been considerably expanded. In the last-named, the important subject of depreciation now has a whole four pages to itself—double its previous allowance! Business economics, such as salesmanship and the organisation of selling departments, are not dealt with.

Both the success and the limitations of this book are traceable to the same cause, namely, that it is written to a syllabus. In fact it is two books in one, the first part dealing with the science of economics and the second with the art of workshop management. Nor is the second in any sense an application of the first, and there is no more reason for grouping them together (other than the aforesaid syllabus) than there would be in grouping economics and design or economics and traction. The first part is necessarily superficial, since the ground it has to cover is so enormous. Nevertheless within the limits available it represents a useful statement of a number of facts which the commercial engineer should know. The second part suffers throughout from an undue vagueness and, whilst it may enable a student to pass an examination, the practising engineer will continue to go back to such standard works as Hiscox's "Factory Lay-out" for precise guidance in his actual labours. Nevertheless the success of the first edition shows the real need for some such book as this. It is to be hoped that the author will not rest content to be merely successful, but will (when the third edition is called for) so tighten up the second part that the result will be not "longer and better," but "shorter and better," than previous editions have been.

The Gates of Light. By BEATRICE IRWIN. Pp. 160, illustrated. London: Rider & Company. Price 7s. 6d. net.

The illuminating engineer, or anyone else interested in the subject of illumination, who desires a complete change from the form of writing to which he is accustomed cannot do better than buy this book. In other volumes dealing with the subject of light and colour, although one may not always agree with everything the author states, his sentences usually bear some definite and assignable meaning. The discerning will understand from this remark why it is that the reviewer finds it impossible to dissent from what Miss Irwin writes in her latest work. To place the matter beyond all doubt the following quotation will suffice:—

> "Radiance is the result of proportion, harmony and rhythm in light, and it is the key-note of our new art. The word radiance implies the moderated manifestation of an inexhaustible source of supply. It suggests a satisfying and balanced expression of light, and an even distribution of its values, regulated by expert knowledge and definite laws! The radiance of the sun itself is no less subject to these definitions than any other radiance! . . . . Broadly speaking, four principles regulate the beauty, health and efficiency of natural illumination, *viz.*, diffusion, fluctuation, concentration and filtration. All these principles underlie, and are creative of radiance, which is the synthetic and subtle essence of illumination, as rhythm is of the dance!"

The book teems with allusions to the author's system of "Colour Filter Illumination," and one of the excellent plates shows us a charming picture with the legend "Beatrice Irwin, A.A., M.I.E.S., E.A.W., in Moorish lecture costume holding 'Nubis' bedside reading portable." The all too brief biographical notice in the appendix enables us to interpret the initials as indicating, respectively, that the author is an Associate in Arts, a member of the Illuminating Engineering Society and a member of the Electrical Association for Women. The greater part of the appendix consists of testimonials to the Irwin colour filter system. One appreciative user writes as follows:—

> "Dear Miss Irwin,—Since the installation of your 'Mandarin' filter I have been entirely free from eye-strain and headaches—a fact which emphasises the importance of the service your lighting renders."

The publishers have done their work well.

Starkstomtechnik.—Vol. II. By E. RZIHA and J. SEIDENER. Seventh edition. Pp. xv+1034. Berlin: W. Ernst und Sohn. Price: Cloth, 34 marks; leather, 37 marks.

This volume contains nine general sections—power stations, power lines, industrial power installations, mines, rolling mills, electrical equipments for cranes, railways, ship installations, and agricultural applications of electricity. Each of these sections is sub-divided into appropriate sub-sections, and within the scope indicated by the section titles, the book is almost an encyclopædia of electro-technical information. All main sections, and many of the sub-sections, are the work of eminent German or Austrian engineers, amongst whom may be mentioned Dr. R. Rudenberg and Engineer L. Kallir, whose names are sufficient evidence of the authoritative nature of the volume.

The section dealing with power lines is chosen here to illustrate in greater detail what the prospective reader can expect from the book. The general theories of direct- and alternating-current networks are recapitulated, and the constructional elements of underground cables and overhead lines are described quantitatively in a most comprehensive manner.

Transmission line calculations especially are developed from fundamental principles to final practical applications, and the reviewer is not aware of any other single source from which so much practical information can be extracted.

There are, inevitably, less favourable aspects of the volume: heavy and somewhat platitudinous pasages are not absent, and the smallness of the type precludes intensive study over long periods.

Nevertheless, on the whole, this book is a remarkable example of German industry and ability, and it is likely to find an honourable place in all important engineering libraries.

Easy Lessons in Television. By R. W. HUTCHINSON, M.Sc. Pp vii+175; figs. 129. London: University Tutorial Press. Price 1s. 9d. net.

This is a comprehensive book for the amateur and student, published at a popular price, and as such is the best we have seen. Almost throughout the writer is concise and exceptionally lucid.

Elementary electrical science is outlined (Chap. I), while simple laws of light are detailed (Chap. II), followed by a discussion upon the human eye and some of its limitations.

Broad principles of batteries, condensers, and inductance are given (Chap. III), together with a fair and clear description of photo-electric cells, neon lamps and small electric motors; continuing, briefly, with scanning disks, loud-speakers, and microphones.

A good attempt is made to convey a general idea of radio communication (Chap. IV), and an explanation of frequency and modulation, before proceeding to give a full account of how wireless transmission and reception of television can be effected.

Chapter V is devoted to an admirable and very useful survey of practical details arising when operating a televisor, making clear the vital need of synchronism, and giving an explanation of the Baird system of effecting this, while Chapter VI deals in detail with thermionic valves and the various manners of their use. Wireless receivers suitable for television are ably described in much detail (Chap. VII), with many valuable diagrams and giving the values of the principal components, while the concluding chapter broadly explains the manner of televising silent and talking films and also mentions television in colour and photo-telegraphy.

The illustrations in the book are good, and the numerous diagrams particularly clear and well arranged, while the book as a whole is exceptionally well written in an interesting manner.

The book should have a wide sale as it should be very useful to the amateur constructor and all users of television apparatus should have it ready to their hands, while it can be confidently recommended to all who desire to cross the threshold of the fascinating study of wireless television.

Examples in Engineering Design. By G. W. BIRD, Wh.Ex., B.Sc. Second edition. Pp. 100; figs. 41. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

The first edition of this publication, which comprises one of the volumes of the "Engineering Degree Series," was published in 1925. In the volume under review the work has been revised and considerably enlarged. In the preliminary presentation of the subject, the examples are chosen in order to familiarise the beginner with the fundamental concepts which are made delightfully clear and explicit. It is obvious that the author has condensed a great deal of matter within the boundaries of this volume; hence, for readers who desire a more exhaustive treatment of the individual subjects dealt with, more advanced treatises should be consulted. The book has been written with the object of supplementing the engineering textbooks which are commonly used by candidates in preparing for university examinations and also to illustrate standard engineering practice suitable for students taking this subject for an engineering degree examination. As stated in the preface "this work is intended to be used in conjunction with a textbook on the subject of theory of machines, so that a knowledge of the theory involved may be gained at the same time that practice is had at the board." The examples given are stated concisely and tersely and the method of treatment might well be taken as a standard by engineering students. The illustrations of machine components are of a highly practical character. The volume adequately covers the ground which is usually associated with machine design in an introductory and interesting manner, giving some idea of typical examples in engineering design. A selection of questions are given taken from the examination papers of the University of London and the Union of Lancashire and Cheshire Institutes. It is throughout accurate in detail and, what is equally important, it maintains throughout its whole course a wide vision on the whole field of modern engineering design which cannot fail to broaden the student's mind and vitalise his outlook.

The examples given are admirably chosen and include the design of a Lancashire boiler, steam engine cylinder, dynamo bearing, cam lever for Diesel engine, spring-loaded safety valve, centrifugal pump, fly-wheel for rope drive, connecting rod and surface condenser. The book is a useful introduction to more advanced volumes on the subject, is profusely illustrated by means of clearly drawn sketches and is free from ambiguity. The large area of the pages (8¼ in. by 11 in.) might be noted usefully by authors of similar publications. The book has distinct merit and can be recommended warmly to students who are studying for the Institution examinations and the university degree examinations in engineering. For this purpose the worked examples throughout the text as well as the exercises at the end of the book are a very valuable feature. The book has been written primarily for young engineers, but it has a message and might be read with advantage by those engaged in a technical capacity in almost any scientific industry, as the data is culled from practice and is the result of a long practical experience.

Parliamentary Notes.

[By Our Special Parliamentary Reporter.]

Telephone Instruments.

On February 17th, CAPTAIN MACDONALD asked the Postmaster-General whether he was aware of the number of telephone subscribers who had ordered but could not obtain hand-microphone instruments; what was the reason of the delay; and was the old type of instrument being returned in sufficient quantity to obviate the need for further supplies of this type being manufactured.

MR. VIANT, Assistant Postmaster-General, said that the reduction on January 1st in the charge for the new instruments naturally produced a large increase in orders which were being worked off as quickly as possible. Special arrangements had been made with the contractors for expediting delivery, which was at present at the rate of 2,000 instruments per week, and would be increased to 3,000 per week within the next month. It would not be necessary to place orders for the old type of instrument for some months to come, but it was too early to say whether a further supply would be required after that period.

Cost of House of Commons Electricity.

On February 17th MR. FREEMAN asked the First Commissioner of Works whether he would state what was the cost per unit of electricity for lighting and power supplied to the House of Commons.

MR. LANSBURY said that the cost per unit was 3¾d. for lighting and 1d. for power.

Scottish Grid Scheme.

On February 19th SIR ARCHIBALD SINCLAIR asked the Minister of Transport whether the scheme for the extension of the main transmission lines into the Highlands of Scotland had yet been sanctioned; whether he was now in a position to give any particulars to the House; and when work was likely to begin.

MR. MORRISON said that further investigations were still in progress, and the Electricity Commissioners had not yet come to a conclusion whether a scheme under the Act of 1926 for extending main transmission lines into Northern Scotland would be economically practicable.

The West Ham Corporation Bill.

Last week a Select Committee of the House of Commons commenced the consideration of this Bill which would give the Corporation power to supply electricity in bulk to the London and North-Eastern Railway Co. Opposition has been entered by electricity undertakings through whose districts the railway runs.

SIR LYNDEN MACASSEY, K.C., for the promoters, said that the question of a bulk supply to the railway company arose from the necessity for the company's obsolescent plant to be superseded. At present the company's annual consumption for purposes other than traction amounted to 10,600,000 kW and more than half of this was used in the West Ham area. The Corporation offered to supply this quantity of energy for a total of £26,850, whereas the next lowest quotation, that of the County of London Electric Supply Co., was £33,600. The Corporation maintained that the opposing authorities would lose nothing if the Bill were passed and would gain nothing if it were rejected, for the company would then continue to generate its own electricity. The promoters were prepared to agree to the insertion of a clause prohibiting them from supplying electricity for traction purposes, or for use outside the present areas in which the company used electricity.

Legal.

Cork Electric Supply Co., Ltd., v. Concannon and the British Thomson-Houston Co., Ltd.

IN the Dublin Supreme Court last week the defendants in this case appealed against an Order made in a lower court by Mr. Justice Johnston in July last.

The action, which was reported in the ELECTRICAL REVIEW of August 1st, 1930, was brought by the plaintiff company to determine whether, as the defendants claimed, the preference shareholders were entitled to participate rateably with the ordinary shareholders in the event of winding up or the capitalisation of certain surpluses. Mr. Justice Johnston ruled that they were not so entitled, merely enjoying priority in the repayment of capital.

The appellants ask for the order to be set aside in favour of a declaration that the preference shareholders are entitled to participate in the distribution of assets or allocation of shares.

The arguments were concluded on Monday last and the Court reserved judgment.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Spanish Brochures for South America.

We have to add three more electrical concerns to the list of those who are producing special brochures in Spanish in connection with the forthcoming British Empire Trade Exhibition in Buenos Aires. Under the title "Una Famosa Fábrica de Ingenieria," the Metropolitan-Vickers Electrical Co., Ltd., presents numerous illustrations of its works and products with sufficient text to indicate what each picture represents. At the end a list is given of Metropolitan-Vickers branches and agencies in South America.

Siemens Bros. & Co., Ltd., have sent us a copy of an attractive booklet which gives brief particulars in Spanish of each item in the display arranged by the company and its associate, Elliott Bros. (London), Ltd. In addition, there are notes on the "Stannos" and "Seelco" wiring systems, telephones, and primary batteries, and a picture of the Cable Ship *Faraday*. Messrs. Siemens have also sent us full details (in English) of their exhibits.

A very handsome portfolio of illustrations of the company's works and products has been prepared by the English Electric Co., Ltd. The cover of this is printed in Argentina's national colours—blue and white—and the text accompanying each picture is in English, Spanish and French. In a pocket is a collection of large reproductions of photographs of plant supplied by the company.

The Siamese Electrical Market.

In the course of a D.O.T. report on economic conditions in Siam (Stationery Office, 1s. net), Mr. J. F. Johns, British Consul-General at Bangkok, says that the steady increase in imports of electrical goods and apparatus is most noteworthy and likely to continue. Unfortunately the United Kingdom, which in 1928-29 headed the list of suppliers, has now fallen behind the United States and Germany to third place. Details given in an appendix to the report show that in 1929-30 the value of imports of electrical goods and apparatus, including machinery, was 4,648,180 ticals, against 3,782,160 ticals in 1928-29 (11 ticals=£1 sterling). The values of the shares of the supplying countries (in ticals) were as follows:—United States, 969,779; Germany, 952,649; United Kingdom, 773,213; Hongkong, 624,198; Singapore, 387,898; Penang, 174,190; Japan, 166,646; and other countries, 599,607. In a foreword to the report it is stated that goods shipped *via* Singapore are mainly British, and those from Hongkong principally Chinese, Japanese and American.

Mr. Johns states that under the Wireless Telegraph Amendment Act of last year the Minister of Commerce and Communications is empowered to issue permits for the importation, manufacture, sale and use of radio apparatus. A public radiotelegraph service between Bangkok and Europe and America was opened in January, 1929, and it is probable that a radiotelephone service (employing Telefunken equipment) will be opened in the near future. The Post and Telegraph Department is contemplating a new network of underground cables for the Bangkok telephone service to replace the existing overhead system, and it is intended to supersede the normal exchanges by modern automatic exchange. The electrification of portions of the State Railways is still under consideration, and a Swedish expert has been engaged to investigate the matter, but no immediate decision is to be expected.

The Electrical Imports of East Africa.

Some information regarding the market for electrical equipment appears in a recent Department of Overseas Trade report upon economic conditions in East Africa by Col. W. H. Franklin, C.B.E., and Mr. C. Kemp, respectively Trade Commissioner and Assistant Trade Commissioner in that territory (Stationery Office, 2s. 9d. net). It is said that in miscellaneous electrical manufactures Britain has lost some trade to Germany and the respective shares of the imports are now, roughly, United Kingdom, 60 per cent., United States 20 per cent., and Germany 12 per cent. In wires and cables Great Britain secures nearly all the trade, although Belgium has been a supplier recently. Electric lamp imports are divided fairly evenly between Great Britain and Holland, although supplies of automobile lamps come from America, and a very cheap and relatively poor line came in from Japan a few months ago in small quantities, purely for bazaar trade. America obtains nearly all the trade in automobile batteries. Until recently Great Britain supplied most of the radio apparatus but Holland now dominates the market. In electrical machinery the British share is fairly stationary at about 65 per cent. of the total, but German competition is strong especially in Tanganyika. Figures set out in appendices to the report show the electrical trade to be very small. In 1929 the total imports of electrical goods and apparatus by the various constituents of East Africa were as follows: Kenya and Uganda £56,516 (Great Britain £42,193) Tanganyika Territory £28,515 (Great Britain £22,256); and Zanzibar £3,613 (£1,452). The imports of electrical machinery into Northern Rhodesia in 1929 were valued at £101,503 (against £23,691 in 1928) of which Great Britain supplied £89,918 (against £17,170).

Irish Free State Electrical Imports.

Probably due to the completion of the Shannon plant as well as to the general trade depression, there was a decline last year in the imports of electrical machinery and apparatus into the Irish Free State. In the preliminary figures for 1930 only six general headings are given, but these are to be supplemented by a more detailed return to be published later. From the appended table it will be seen that radio apparatus was the only item showing an increase, the decline in the total value of imports amounting to £94,319.

	1929. £	1930. £
Electrical machinery	313,201	287,003
Electric wires and cables	198,850	164,814
Electric lamps and parts	93,024	90,782
Wireless sets and parts	93,115	106,484
Other electrical goods	230,701	226,274
Copper wire	88,093	47,308
Totals	£1,016,984	£922,665

A Power Company and Contractors Co-operate.

It is one of the aims of the Shropshire, Worcestershire and Staffordshire Electric Power Co. to work in close association with the electrical contractors in its extensive area of supply. For three years there has been in existence a special E.D.A. Circle for this purpose, and now the company has acquired the South Wales Power Co. it is forming a similar Circle for the area of that company. The existing S.W. & S. (E.D.A.) Area Circle has nearly a hundred contractor members, who have adopted a special electric sign to display outside their premises. The public is being educated to look for this sign when placing installation work by means of joint advertisements which appear periodically in the large weekly papers circulated in the area. Mr. J. T. H. Legge, who is now managing director of the South Wales Co., has sent us an example of this co-operative advertising, which is of a very effective character.

Radio Exports during 1930.

The *Wireless and Gramophone Trader* publishes details of the exports of radio apparatus, including valves, from this country during 1930. It is shown that the total value of these exports was £1,140,825, as compared with £1,177,107 in 1929. Australia, with a share valued at £120,537 (against £138,850) was the principal importer, the Netherlands being second with £113,730 (against £146,178). Other large purchasers of this apparatus were the Union of South Africa, £90,915 (against £49,511); Italy, £87,061 (against £52,878); France, £75,631 (against £45,093); and the Irish Free State, £59,161 (against £63,545). The re-exports rose from £57,532 to £243,438. Holland was mainly responsible for the increase, its share rising from £7,049 to £185,748.

Wages in the Cable-making Industry.

The Joint Industrial Council for the Electrical Cable-making Industry has sent us a copy of the new schedule of wages which comes into force on the third pay-day in March for the period covered by that pay-day. The alterations have been necessitated by the fall in the cost of living.

Philips' Lampworks' Shorter Hours.

It is reported that the Philips' Glowlamp Works, of Eindhoven, Holland, has instituted a week of 40 hours in the place of the existing 42-hour week in a number of departments. Wages are to remain at the same level. The decision was made to avoid the dismissal of about 500 men.

The E.D.A. March Programme.

Accompanying the March programme of the British Electrical Development Association is a pamphlet (E.D.A. 925) outlining briefly "The Organisation of Eda Electric Homes," and in connection with this section of the Electric Homes Campaign a booklet (E.D.A. 923) has been prepared, giving full details of furnishing, wiring, electrical equipment, staffing and management of demonstration electric houses, including a scheme of publicity and advertising, with examples. The programme contains brief particulars of a demonstration house to be opened in Bristol on March 2nd. A specially prepared advertisement

The E.D.A. March Window Display.

for electricity suppliers, contractors and dealers is illustrated, while a price list of literature for the month, dealing with heating, cooking and spring cleaning is given. The window display for the month continues the modernised scheme, the general setting being both simple and effective. As will be seen from the accompanying illustration, the appliances featured are kettles, irons and a cooker. A list of forthcoming conferences in London and the provinces is included, and the director announces an arrangement with a Lancashire daily paper for the early publication of a series of articles under the title "This Electric Age."

Miss Wilkinson and Hire-purchase.

At a luncheon organised by the Household Appliance Section of the London Chamber of Commerce last week Miss Ellen Wilkinson, M.P., presented the case for the Hire-Purchase Bill which she is sponsoring in the House of Commons. Stating that she herself had employed the system in acquiring goods, she disclaimed any intention of handicapping hire-purchase business. Her sole desire was to protect the customer who through no fault of his own was forced to discontinue payments, and to protect the trader from having his goods seized by the landlord. The Bill is being vigorously opposed by the Hire Traders' Protection Association which, while appreciating Miss Wilkinson's good intentions, consider that it will be harmful to their business.

A Mock Trial.

Under the auspices of the British Electrical Development Association an action is to be tried at the Bleachers' Hall, Blackfriars House, Blackfriars Street, Manchester, on March 9th and 12th. In this the plaintiff "John Nodole" claims damages from his employers "Gloom and Glare, Unlimited," for injuries received in an accident alleged to be directly due to the inadequate lighting of the defendants' workshop. "Mr. Justice Edelma" is to hear the action. The defendants will contest the claim and thus provide considerable material for the judge and jury.

Recent Contracts.

Among the latest orders received by Messrs. PETTERS, LTD., Yeovil, are one from the Government of Malta and another from Rangoon. The first is for a 4-cylinder 160-b.h.p. atomic Diesel heavy-oil engine directly coupled to a Brush revolving-field alternator rated at 75 kW (0.8 p.f.), with a four-pole inter-polar exciter. The set is installed in the Government Electrical Works. The second order covers a generating plant for a jetty, consisting of a single-cylinder atomic Diesel engine coupled directly to a Metropolitan-Vickers d.c. generator.

FRIGIDAIRE, LTD., informs us that Messrs. J. Lyons & Co., Ltd., have ordered a further 179 "Frigidaire" ice cream cabinets, bringing the total number of their "Frigidaire" installations up to 7,000.

Dundee Cable Contract.

Dundee Corporation, which has frequently accepted foreign tenders for cable, owing to the difference in prices as compared with British tenders, has been recommended by the Electricity Committee, at its last meeting, to accept offers from British manufacturers amounting to £2,219 for cable, the prices being approximately 10 per cent. higher than the foreign offers. The committee approved because of the smallness of the margin.

A Large Liner Contract.

The BRITISH THOMSON-HOUSTON CO., LTD., Rugby, has received an order for the seven turbo-generators which will be required for the auxiliary services on the giant liner now being built at Clydebank by Messrs. John Brown and Co., Ltd., for the Cunard Steamship Company's express passenger service between Southampton and New York. This liner will be over 1,000 ft. long and have a displacement of over 70,000 tons, so that she will be by far the largest ship in the world. Each of the turbo-generators will be rated at 1,300 kW (normal), 225 V, with an overload capacity of 25 per cent. for two hours and 50 per cent. for five minutes. Each set will comprise a 10-stage turbine driving a direct-current generator through single reduction gearing all of B.T.-H. manufacture, the speed of the turbine being 5,000 r.p.m. and the speed of the generator 600 r.p.m. The condenser is integral with the turbine, the whole unit being on the one floor level. The four main machinery sets are intended for supplying power to the numerous motor-driven auxiliaries, such as pumps for water, lubricating and fuel oil, bilge and ballast, &c. The three "hotel service" sets are intended for supplying the numerous electrical services installed for the comfort of both passengers and crew, including heating, cooking, ventilation, lifts, pumps for sanitary service, swimming baths, &c., as well as the very heavy lighting load.

The latter sets will be required in port as well as at sea, and they are accordingly arranged to operate off auxiliary boilers.

Welwyn Garden City Showrooms.

New electrical showrooms have recently been opened by Welwyn Garden City, Ltd., equipped with a wide range of

A Welwyn Electrical Window Display.

domestic appliances. A feature of the showrooms is the display windows, which are fitted with a black plate glass background, relieved by chromium-plated fittings. When illuminated at night this background enhances the display of appliances. We understand that excellent business has been done as a result of the opening of these showrooms. The company's chief engineer is Mr. V. Bullen, who was responsible for the equipment and the general display. One of the display windows is shown in the accompanying illustration.

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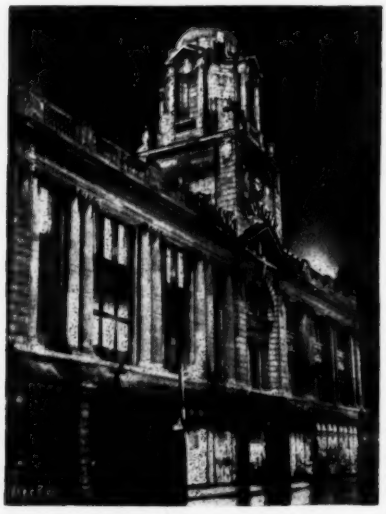
New French Companies.

Among the concerns recently organised in France are the Société de l'Union Electrique du Rhin, Mulhouse, capital £320,000, to act as a holding concern of shares in the various electric power supply undertakings on the Rhine; and La Société de Gérance et d'Exploitations Electriques (Sogerex), Dijon (124, Avenue Victor Hugo), capital £26,400, to acquire an interest in the Société des Entreprises Electriques du Centre.

Floodlighting at West Hartlepool.

The building illustrated in the accompanying picture is the headquarters of the Hartlepools Co-operative Society at West Hartlepool. The building has an imposing facade and a domed clock tower, which make it a suitable subject for flood-lighting.



Co-operative Building, West Hartlepool.

International Standard in Denmark.

In view of its constantly increasing activities in Denmark, the International Standard Electric Corporation has established a separate Danish company to take over all its interests in Denmark. The new company, Danish Standard Electric A/S, has secured exclusive rights for Denmark for the use of the International Standard Electric Corporation's patents and manufacturing methods. It has a capital of 1,000,000 kroner, and the board of directors comprises Messrs. Johannes P. Stensballe (chairman), M. B. Richter, E. A. Brofos, Paul Hallgren, and A. V. Jörgensen, with Mr. S. M. Gelberg as manager. The new enterprise marks a further development in the co-operation which has existed for many years between the International Standard Electric Corporation and certain Danish manufacturers, notably Nordiske Kabel-og Traadfabriker in the loaded toll cable field and Telefon Fabrik Automatic in the provision of automatic telephone exchanges and equipment.

Book Notices.

"Anglo-American Year Book, 1931," edited by H. Russell Amory. London: American Chamber of Commerce in London. Price 15s. net. This is the 9th edition of this useful compendium on Anglo-American affairs. The special articles published in the 1930 edition are again included, while a complete statistical record is given of British-American trade during 1930. Of particular interest to companies engaged in Anglo-American trade is the commercial directory of 8,500 names and addresses of principal firms together with their agents, representatives of affiliated houses in Great Britain and the United States. All the features of the 1930 edition are retained and have been thoroughly revised and brought up-to-date.

"Powdered and Granulated Aluminium." Publication No. 332 of the British Aluminium Co., Ltd., gives in an interesting manner particulars of the properties of aluminium in granulated and powder form and its use for paints, &c.

We have received from the Information Bureau, Trafford Park Estates, Ltd., copies of two attractively-produced publications entitled "Manchester—The Centre" and "Where Should My Factory Be?", setting forth the attractions of the Manchester district for factory positions.

"Laxton's and Lockwood's Builders' Price Book, 1931." London: Kelly's Directories, Ltd. Price 7s. 6d. net.—The 114th edition of this useful work has been subjected to a thorough revision and correction and the electrical section has been considerably extended and enlarged. The alphabetical list of specialities, proprietary articles and brands (some 10,000 in all) has received most careful attention and has been extended.

"Industrial Durban: Opportunities at Port Natal." (80 pp., illus.).—This well-produced book, published under the joint auspices of the Durban Corporation and other bodies, deals in an interesting way with local industries, facilities, and opportunities.

"Uniflow, Back-pressure and Steam Extracting Machines," by T. Allen. Pp. xviii+660; figs. 359. London: Sir Isaac Pitman & Sons, Ltd. Price £2 2s. net.

"Amber to Ampères," by Ernest Greenwood. Pp. ix+332; illustrated. London: Harper & Brothers. Price 15s. net.

We have received from Messrs. Alfred Herbert, Ltd., a copy of an interesting lecture entitled "The Development of Machinery in Coventry," which was given by Sir Alfred Herbert before the Coventry Workers' Educational Association last year.

Sweden's Foreign Electrical Trade.

Despite the world trade depression, an active state of affairs prevailed in the electrical industry in Sweden during last year. The official returns just to hand show that the exports of electrical machinery from the country during 1930 attained a value of £3,245,730 as compared with £2,940,495 in the preceding twelve months. Notwithstanding the extent of the home industry, Sweden is still a large market for foreign electrical machinery, as may be judged from the fact that the imports last year amounted to £1,495,865 as compared with £1,151,515 in 1929.

Swedish Activity in Russia.

The Russian subsidiary of the Allmänna Svenska Elektriska Aktiebolaget has recently completed large works at Jaroslawl, in the Volga district, for the production of electrical machinery. The factory, which will give employment to about 1,300 people, has been designed for an output up to 30,000 dynamos and motors of varying sizes per year.

Electrical Manufacturing in China.

The Government Radio and Electric Works in Shanghai has recently been taken over by the National Reconstruction Commission and reorganised into the "Electrical Manufacturing Works." Besides producing radio transmitters and receiving sets, the works is preparing to manufacture standard electrical supplies for the power industry. A new factory has been built on the south bund of the Whangpoo River, near Shanghai, and large-scale production will be started early in the current year.

Employment during January.

The February *Ministry of Labour Gazette* reports that employment in the engineering industry remained bad during January and showed a decline in all sections except the motor vehicle section, in which there was some improvement. In electrical engineering, although there was a considerable decline, employment was still relatively moderate. The number of unemployed in the engineering industry as a whole rose to 226,323, *i.e.*, from 21.8 to 22.2 per cent. In the electrical engineering section the number was 12,516, representing an increase from 11.1 to 13.9 per cent. The electrical cable, wire and lamp manufacturing group reported 13,240 unemployed, showing a rise from 10.5 to 12.9 per cent. The electrical wiring and contracting industry also reported an increase in unemployment—from 12.5 to 13.6 per cent., the number of unemployed being 2,515.

New Siemens Branch at Sheffield.

We recently reported that the Sheffield branch of Siemens Electric Lamps and Supplies, Ltd., had been removed to "Siemens House," 57-59, West Street. We are now able to reproduce a view of the showroom in the new premises, in which the latest designs of electric lighting fittings, domestic appliances, &c., have been attractively arranged.

The New Siemens Branch at Sheffield.

Czecho-Slovakian Electrical Imports.

During December last electrical machinery and apparatus valued at 36 million crowns (£220,000) was imported into Czecho-Slovakia, raising the total for the whole of 1930 to 327 million cr. (£2,000,000 approx.).

A French Technical Journal's Jubilee.

In order to commemorate the completion of the first fifty years of its existence, our French contemporary "Le Genie Civil" has just issued a special number containing nearly 250 pages dealing with the progress that has been made in the various branches of engineering since 1880. Of electrical interest are noteworthy articles on "The Electrification of Railways," by M. H. Parodi; "Lighting Progress," by M. H. Laurain; "The Important Electrical Industry," by M. P. Janet; "Electrochemistry and Electrometallurgy in 1880 and 1930," by M. H. Gall; "Telegraphy and Telephony Progress," by E. Reynaud-Bonin; "The Discovery and Development of Radio-Electricity," by M. A. Blondel; "Hydro-Electric Stations," by M. E. Eydoux; and "The Evolution of Water-power Utilisation," by M. E. Genissieu.

For Sale.

Four steam generating sets are offered for sale by Messrs. Oxley & Co. (Machinery), Ltd.

Fleetwood Urban District Council has for disposal a 550-kW turbo-generator set with condenser and pipework.

Manchester Corporation Electricity Department invites tenders for the purchase and removal of second-hand d.c. motors and an alternator.

(See our advertisement pages to-day.)

New Catalogues and Lists.

The EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, London, E.C.4.—A complete catalogue of the company's products. This publication comprises the whole of the company's sectional catalogues, and the binding arrangements are such that revisions or additions can easily be inserted. Among the subjects covered are lamps, commercial lighting, wires, cables, wiring systems, domestic appliances, accumulators, batteries, tungar rectifiers and radio apparatus. A clear system of visible indexing is incorporated. We have also received copies of a new "Ediswan" electric iron showcard and folder.

The CROYDON ENGINEERING CO., LTD., Victory Works, Gloucester Road, Croydon.—An illustrated catalogue dealing with "Croydon" fractional h.p. motors.

STURTEVANT ENGINEERING CO., LTD., 147, Queen Victoria Street, London, E.C.4.—A 44-page booklet, excellently illustrated, relating to the manifold applications of the "Sturtevant" industrial turbine vacuum cleaners.

MUREX WELDING PROCESSES, LTD., Ferry Lane Works, Forest Road, London, E.17.—An interesting booklet, entitled "Copper Welding by the 'Premag' Process."

A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, London, S.W.1.—The London stock list of electric motors, circuit breakers, distribution boxes, meters, domestic appliances, &c.

HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—The February issue of the "Wigan Review," containing details of the "Wigan" prismatic fittings and battery-call telephones.

JOHN SHAW & SONS (WOLVERHAMPTON), LTD., Wolverhampton.—Particulars of a special hire-purchase scheme for "Trojan" vacuum cleaners.

E. P. ALLAM & CO., LTD., 107-9, Gray's Inn Road, London, W.C.1.—A stock list (No. 50) of d.c. electric motors for sale, hire, or hire-purchase.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.—Publication No. 6,700, giving details of "Igranic" automatic pressure switches for the regulation of electric motor-driven pumps, air compressors, &c.

FEED WATER SPECIALISTS CO., St. Paul's Square, Liverpool.—Technical publication No. 30, dealing with boiler explosions during 1929, a floating power plant, &c.

E. GREEN & SON, LTD., Wakefield.—An illustrated brochure on cast-iron oval tube type air heaters.

CROSSLEY BROTHERS, LTD., Openshaw, Manchester.—Four pamphlets dealing respectively with a new range of small Diesel engines from 9 to 15 b.h.p., the West Mill waterworks of the Bishop Auckland Urban District Council, vertical compressorless Diesel engines, and general "Crossley" products.

JOHN DUGDILL & CO., LTD., Hazel Grove, near Stockport.—A list of some of the users of "Dugdill's" movable electrical fittings who have given repeat orders.

REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, Staffs.—A well produced illustrated brochure (72 pages), showing the comprehensive nature of the company's activities in all forms of public and street lighting.

ALLEN WEST & CO., LTD., Brighton.—Two striking folders describing the "S.A.1" totally-enclosed air break hand-operated starters and the "S.C.2" contactor starters for squirrel-cage induction motors.

A. REYROLLE & CO., LTD., Hebburn-on-Tyne.—Pamphlet No. 814, describing the company's electrically-heated drying-ovens.

F. GILMAN (B.S.T.), LTD., 221, High Street, Smethwick.—A catalogue dealing with "Multi-Flex" flexible-drive tools for polishing, drilling, filing, grinding, die-sinking, &c.

WALKER BROS., LTD., Quality House, Temple Row, Birmingham.—The March issue of the company's pamphlet, the "Electrical News," containing interesting articles on architecture in lighting, space heating by electricity, &c.

The PHŒNIX TELEPHONE & ELECTRIC WORKS, LTD., 38, Newman Street, Oxford Street, London, W.1.—Publication No. 102 dealing with "Phœnette" telephones for adapting to electric bell circuits, &c.

The BRITISH ELECTRIC TRANSFORMER CO., LTD., Wellington House, Strand, London, W.C.2.—Section 2 of catalogue No. 43, which deals with suggested designs for heavy duty cooking apparatus. Also a leaflet describing the "Tricity Tot" combination cooker and the "Tricity Tweeny" combination cooker in "de luxe" finish.

The WEST INSULATING CO., LTD., 123d, Victoria Street, London, S.W.1.—Two pamphlets, one describing the various applications and treatment of the company's enamelled ware, and the other dealing with the company's insulating materials generally.

Social Events.

The annual dinner of the employés of the Shropshire, Worcestershire and Staffordshire Electric Power Co. was held recently at Dudley Town Hall, over 400 being present. Mr. J. T. H. Legge, in responding to the toast of the S.W.S. Company, referred to the present and future developments of the company, and said at Stourport they were engaged in the installation of a fourth turbine. He believed that when that came into operation it would be the largest in the Midlands. Industry at the moment was none too good, but the company was still looking ahead. They had every confidence in the success of their effort, and they had decided to spend another £650,000 on power lines in the eastern section of their area, including Redditch, Evesham, Banbury and Cheltenham. The evening was concluded with an entertainment provided by the Lyrics Concert Party.

The Football Section of the Union Cable Sports and Social Club received W. T. Henley's F.C. in the second round of the Cable Makers' Cup at Dagenham on February 14th. The Union Cable team won by 5 goals to 1. After the game, both teams were entertained at dinner in the Club's pavilion, and Mr. J. Snow Huddleston, general manager of the company and president of the Club, congratulated the teams on their clean and sporting game. The Union Cable team will entertain the Liverpool Cable team in the semi-final tie.

The annual whist drive and dance of Messrs. Wood & Cairns, Ltd., was held at Windsor House, Edinburgh, on February 20th, when a company of over 100 spent an enjoyable evening. Mr. R. K. Hill, managing director, presented the whist prizes.

Bankruptcy Proceedings.

A. C. E. APPLIN, trading as Applin & Burt, electrical engineer, 110, St. Mary's Road, Southampton.—The public examination of this debtor was held on February 18th. His statement of affairs showed a deficiency of £846. The debtor stated that after trading on his own account for some time he took another into partnership. Early last year the partners installed talking-film apparatus in certain kinemas, the proprietors of the theatres undertaking to pay for the work by instalments. They completed a contract at Southampton, and another at Inverness, the latter working out at a loss. The partnership was then dissolved, and at that time the liabilities, which the debtor took over, amounted to £1,000, while the assets were worth £500. The debtor said that his liabilities also included money which his father had lent him and guaranteed on his behalf. He attributed his failure to "the taking over of the debts of his partner, losses in connection with the installation of 'talkie' apparatus, and trade depression." The examination was formally adjourned.

G. A. WOOD, 22, Kimberley Road, Astley Bridge, Bolton, Lancs., electrician and radio engineer.—This debtor appeared at the Court House, Bolton, recently for his public examination. His statement of affairs showed liabilities of £52 and a deficiency of £5. The debtor had at one time traded with another in partnership as an electrical and radio engineer at Horwich. The partnership was later dissolved, and the debtor continued to trade on his own account as the Premier Electric Co. at the same address. Later he obtained employment as a foreman electrician. The debtor was questioned at some length regarding his father's estate, and the examination was eventually closed.

L. E. CANNON, electrical engineer, 327, Grand Buildings, Trafalgar Square, W.C.—The receiving order in this case was made on February 6th at the London Bankruptcy Court upon the petition of Philips Lamps, Ltd., the act of bankruptcy alleged being non-compliance with the requirements of a duly-served bankruptcy notice. The first meeting of creditors was held on February 19th. The debtor did not attend and it was reported that nothing was known regarding his present whereabouts. The case was left in the hands of the Official Receiver.

S. GILLETT (G.E.T. Electrical Supplies Co.), electrical goods dealer, Lansdowne, Offerton Lane, Offerton, near Stockport.—Receiving order made February 17th on a creditor's petition.

S. HOLMES, electrical engineer, 5, Gibson Street, Burmantofts.—Supplemental dividend of 2s. 4½d. in the £, payable March 16th at the Official Receiver's office, 24, Bond Street, Leeds.

H. G. PRICE, general and electrical engineer, 18-20, Canal Street, Nottingham.—Receiving order made February 13th on the debtor's own petition.

J. JOHNSON, wireless, gramophone and electrical dealer, 6, Cross Street, Willenhall, Staffs.—Receiving order made February 13th on a creditor's petition.

C. W. WHITLE, electrical sales engineer, 45, Fife Road, Darlington.—First meeting to be held to-day (February 27th) at the Official Receiver's offices, 80, High Street, Stockton-on-Tees. Public examination March 5th, at the Court House, Bridge Road, Stockton-on-Tees.

F. W. WRIGHT, electrical engineer, &c., London Road, Tetbury, Gloucester.—First and final dividend of 3s. 0½d. in the £, payable March 3rd at the Official Receiver's offices, 38, Regent Circus, Swindon.

Company Liquidations.

CENTRAL ELECTRIC DEVELOPMENT CO., LTD.—Winding up voluntarily. Liquidator, Mr. C. Chapman, 33, Brynhyfryd Avenue, Newport, Mon.

HERTFORDSHIRE MOTORS, LTD.—Meeting March 23rd at 82, High Street, Ware, to receive an account of the winding up of the company.

Winding-up Petitions.

W. H. DIXON & CO., LTD.—A petition for the winding up of this company has been presented to the High Court by C. Quitmann, 3, Cloth Street, Long Lane, London, and will be heard in London on March 2nd.

KENSAL RADIO MANUFACTURING CO., LTD.—A petition for the winding up of this company has been presented to the High Court by K. Brooks, Ltd., and will be heard in London on March 2nd.

Dissolution of Partnership.

FREEMAN & BALL, electrical contractors, 83, High Street, Birmingham.—Mr. C. A. Freeman and Mr. A. H. Ball have dissolved partnership.

Unemployment.

A decrease of 5,919 was shown in the number of persons on the registers of the Employment Exchanges in Great Britain during the week ended February 16th. At that date the total was 2,631,212, as compared with 2,637,131 on February 9th, and 1,523,941 on February 17th, 1930.

Trade Announcements.

The business of patent movable electrical fittings makers, for many years carried on by the late Mr. John Dugdill and Mr. E. J. Dugdill at Hazel Grove, near Stockport, has now been taken over by a private limited company, formed by members of the family, under the management of Mr. Harold F. Dugdill, at the same address.

MR. J. POULSON, electrical and radio engineer, 26, St. Loyes Street, Bedford, announces that he has given up his business and the stock has been disposed of by auction this week.

Prices of Materials.

Messrs. F. Smith & Co. report, February 24th: Copper (electrolytic) bars: £50 5s., 7s. 6d. inc.; ditto ditto sheets and wire rods: no change; ditto ditto h.c. wire: 7¾d., 1/16d. inc.

Messrs. Edward Till & Co. report, February 24th: India-rubber, Para fine: no change.

Messrs. James & Shakespeare report, February 24th: Copper bars (best selected), sheet and rod: no change. English pig lead: £15 10s., 15s. inc.

Messrs. James Forster & Co., in their letter dated February 21st, state that after a steadier opening on Monday last week the tone of the lead market became firm, prices advancing daily until a slight reaction took place just before the close of the week. The renewed firmness is thought to be due mainly to sentiment in keeping with other metals. Consumers' demand remains very quiet. The rise has been very rapid and there may be a reaction in the near future.

Lighting and Power Notes.

Algeria.—ELECTRICAL DEVELOPMENT.—At a recent conference in Algiers reports were presented by a number of electrical engineers on the electrical development that has taken place in the country during recent years. According to M. Vignaud, the generating plant in North Africa now represents a total of 220,000 kW, of which 190,000 kW is operated by steam and internal-combustion engines and 30,000 kW by water power. Further plant representing a total of 100,000 kW is in course of erection. M. Murat, who reported on rural electrification in Algeria, stated that good progress was being made owing to joint activities on the part of the supply undertakings and what are known as agricultural electricity co-operative unions. Last year the Algerian Government voted a sum of £144,000 towards the development work.

Bedford.—AUGMENTED SUPPLY TO LIDLINGTON.—The Corporation Electricity Committee is to augment the supply to Lidlington, at a cost of £2,420.

Bexhill-on-Sea.—EXTENSIONS.—The Corporation Electricity Committee is to extend plant and mains at a cost of £4,050. Application is to be made for sanction to the borrowing of an additional sum of £5,000 for mains extensions and house services.

Blackpool.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department show a successful year, the surplus being £35,500 as against an estimated surplus of £32,000. For the coming year a surplus of £23,000 is anticipated. The income from private lighting, estimated at £212,000, reached £216,000, and is estimated that it will amount to £218,000 in the coming year. The total expenditure was £154,300, or £2,000 more than estimated. Concessions have been granted to heating and power consumers, and also in street lighting charges, amounting in all to £10,000.

LOAN FOR METERS.—Application is to be made for sanction to a loan of £10,000 for electricity meters.

Buckie.—CONTRACT PLACED FOR ELECTRICITY SCHEME.—Messrs. Thomas Laurie & Co., Ltd., of Falkirk, have secured the contract for the introduction of electricity into the fishing town of Buckie. The electrical energy is to be produced by two Diesel engines.

Bury St. Edmunds.—CHANGE-OVER SCHEME.—The borough electrical engineer, Mr. A. E. Knights, has presented to the Town Council a change-over scheme, the estimated cost of which is £40,900. The matter is to be discussed at a special meeting of the Council.

Canada.—WINNIPEG'S HYDRO-ELECTRIC SYSTEM.—The City Council has refused an offer of $30,000,000 from a Montreal company for the Winnipeg hydro-electric system, which is at present municipally owned.—*Reuter* (Winnipeg).

Cardiff.—POWER STATION EXTENSIONS.—The Corporation Electricity Committee recommends that application shall be made for sanction to a loan of £80,000 for extensions of the generating and boiler plant at the Roath power station.

Clitheroe.—PROPOSED EXTENSIONS.—The Town Council has decided to apply to the Electricity Commissioners for powers to supply electricity in the whole of the rural district of Bowland.

Congleton.—INAUGURATION OF SUPPLY.—The ceremony of inaugurating Congleton's new electricity undertaking was performed on Saturday last at the Bromley Lane sub-station by the Mayor, Councillor R. A. Daniel. Councillor F. C. Pass, chairman of the Corporation Electricity Committee then switched on the supply from the sub-station to the mains. The total cost of the scheme has been approximately £35,000 and application has been made for a further £12,000 for extensions. The electricity supply is received in bulk from Stoke.

Continental.—ITALY.—For the first ten months of 1930 the output of electricity was over 3 per cent. larger and the installed capacity of the industry 10.8 per cent. larger than for the same period of the previous year.—*Reuter's Trade Service* (Rome).

PORTUGAL.—From the Electrical Service Division of the Portuguese Government Department of Hydraulic and Electrical Services we have received a copy of the recently-issued Government report on the position of electric power supply in Portugal. The report shows that at the beginning of 1930 there were 44 public hydro-electric power stations with a total capacity of 30,401 kW in operation in Portugal together with 28 privately-owned similar plants, mostly, however, of a small size, their total capacity being only 5,604 kW. The number of publicly-owned electricity plants operated by steam or internal combustion engines is given as 123 (70,189 kW) and of private plants 193 (38,026 kW). The combined number of electric power stations in Portugal is thus 388 and the aggregate capacity 144,222 kW. A table giving the capacity of the individual plants shows that of the 72 hydraulic stations 44 have a capacity of not more than 100 kW, and that only two, averaging 9,560 kW, have a capacity exceeding 5,000 kW. Of the 316 steam and internal combustion engine-operated stations, the total capacity of 108,216 kW is divided up as follows: Steam 87,948 kW, producer gas 7,000 kW, and heavy oil 13,268 kW. The output of power from publicly-owned plant during 1929 amounted to 187,157,780 kWh, an increase of 16 per cent. as compared with 1928. On the other hand that of private plants declined by 4 per cent. to 53,267,927 kWh. As to the uses to which the power was put, approximately 47 per cent. was utilised for public and private lighting, 30 per cent. for power purposes, 20 per cent. for traction, and 3 per cent. for the electro-chemical industries.

Coventry.—PROPOSED IMPROVEMENTS AT REFUSE DESTRUCTOR.—At a recent meeting of the Corporation Electricity Committee consideration was given to the city engineer's suggestion that a 600-kW turbo-alternator should be installed at the refuse destructor and the electricity generated delivered to the Sandy Lane switchboards. The estimated cost of installing the proposed plant is £7,000. The General Works Committee is to be informed that the Electricity Committee is prepared, subject to any necessary sanction of the Electricity Commissioners, to enter into the proposed arrangement.

Croydon.—ADDITIONAL SUPPLY.—The Corporation Electricity Committee is to give an additional supply of electricity to Messrs. Grant Bros., High Street, at a cost of £1,557 for plant and mains.

Dundee.—NEW SUB-STATION AND CHANGE-OVER.—The Corporation Electricity Committee has approved the erection of a new sub-station and the change-over of the supply to a.c. in Perth Road district at a cost of £1,950.

Eston.—NEW TARIFF.—The Urban District Council Electricity Committee has adopted a special two-rate tariff for rental wiring consumers taking supplies through prepayment

meters. The new tariff is a combination of lighting and heating charges. A plug is to be installed free of charge on condition that the consumers agree to purchase, hire, or hire-purchase electric irons, kettles, or other domestic apparatus.

Finchley.—MAINS EXTENSIONS.—The Urban District Council Electricity Committee recommends the extension of mains at an estimated cost of £941.

Gatehouse (Galloway).—INAUGURATION OF SUPPLY.—The electricity scheme for Gatehouse introduced by the Dalbeattie Electric Light & Power Co., Ltd., was inaugurated on Thursday, February 19th, by Provost Laurie.

Glasgow.—PROGRESS DURING JANUARY.—Under the Corporation Electricity Department's scheme 605 houses were wired in January, making the total to date 29,324. Appliances let out on hire numbered 69, making the total 21,085.

MAINS EXTENSION.—The Electricity Committee recommends the laying of distributing mains at a cost of £2,860.

LIGHTING OF TRANSPORT OFFICES.—The Municipal Transport Committee has approved a proposal to illuminate the head office buildings of the Transport Department at a cost of approximately £1,600. The manager has been instructed to invite offers for the installation.

Gravesend.—EXTENSIONS.—The Town Council is extending the supply of electricity to the parish of Chalk, and has applied for sanction to a loan of £1,800 for the work. Mains are also to be laid in the town and to the Denton and Northfleet housing estates at an estimated cost of £10,755.

London.—STOKE NEWINGTON.—The Borough Council Finance Committee recommends that application be made for sanction to the borrowing of £5,000 for free wiring installations.

The adoption of a new charge of ¾d. per kWh for electricity supplied during the night time only is also proposed by the Committee.

BATTERSEA.—Arrangements for changing over the supply from d.c. to a.c. in certain areas at an estimated cost of £562 are being made by the Borough Council Electricity Committee. The Committee has also decided to replace old vulcanised bitumen distributors with insulated lead covered and armoured cables at a total estimated cost of £29,266. Other works to be carried out include: Electricity services to 127 premises, £1,150; extension of mains for private services, £2,095; and the provision of rising mains at Albany Mansion, £282.

ST. PANCRAS.—The Borough Council Electricity and Public Lighting Committee proposes to extend mains at an estimated cost of £933.

HACKNEY.—The Borough Council proposes to apply for sanction to a loan of £20,000 required for the free-wiring prepayment scheme. Street lighting improvements costing £4,734 are recommended by the Works and Open Spaces Committee.

HAMMERSMITH.—An additional supply of electricity is to be given by the Borough Council Electricity Committee to the Gaumont Co., Ltd., at an estimated cost of £3,178.

SPECIAL ORDER.—The Notting Hill Electric Lighting Co., Ltd., is applying to the Electricity Commissioners for a Special Order authorising it to supply electricity to Kensal Town.

Lowestoft.—SUPPLY TO PAKEFIELD.—The Town Council has received sanction to a loan of £2,075 in connection with the supply of electricity to Pakefield, and at the request of the Commissioners sanction to a further loan of £1,555, for e.h.p. cables, kiosks, and transformers, has been applied for.

Macclesfield.—PROPOSED PURCHASE OF UNDERTAKING.—Subject to satisfactory terms being arranged, the Corporation has decided to exercise its right to purchase the town's electricity undertaking in 1932.

Northern Ireland.—INQUIRY.—An inquiry into the application of the Electricity Distribution Company of Northern Ireland for authority to supply electricity in a large area is to be held in Belfast on March 3rd.

Nuneaton.—CHANGE-OVER.—The Town Council proposes to carry out a scheme for the change-over of the electricity supply system from d.c. to a.c., at an estimated cost of £60,000.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

AYLESBURY.—Lighting for shops, business and combined premises: From 1¾d. to 1¼d. per kWh in the borough, and in the extended area of supply from 1¾d. to 1½d. per kWh. In the former area there is to be a charge of 8s. per annum for each 25 watts demand, and in the latter area a charge of 10s. per annum. Tariff for electrical contractors' showrooms: In the borough, 17s. per annum per 100 watts, and an indicator charge of 10s. per annum plus 1¼d. per kWh; and in the extended area of supply, £1 per annum per 100 watts, and indicator charge of 10s. per annum, plus 1½d. per kWh.

BLACKPOOL.—Late shop-window lighting: To 2d. per kWh.

DERBY.—Lighting through prepayment meters: From 5d. to 4½d. per kWh. Rateable value charge from 1d. to ¾d. per kWh after energy equivalent to the 10 per cent. on rateable value has been consumed at the lighting rate of 4d. per kWh.

Seaham Harbour.—LOAN.—The Urban District Council Electricity Committee is applying for sanction to the borrowing of £1,000 for the purchase of apparatus for hire purposes.

Southend-on-Sea.—CHANGE-OVER.—The Town Council has applied for an unemployment grant in connection with the change-over work still to be executed at a cost of £50,000, and in respect of the erection of five further transformer stations to cost £11,760.

LOAN SANCTIONED.—Sanction has been received to a loan of £3,627 for the installation of a 250-kW rotary convertor at Thorpe Bay sub-station and for additional switchgear in connection with the transfer of the 750-kW convertor from Thorpe Bay to the sub-station at Leigh.

Tonbridge.—ELECTRICAL APPARATUS FOR HOSPITAL.—The Rural District Council has decided to have electrical apparatus installed for cooking and water heating at the isolation hospital. Electricity will be supplied by the Tunbridge Wells Corporation.

United States.—ELECTRICITY GENERATING STATISTICS.—Preliminary figures for the production of electric power during 1930 show a further increase in the output of electricity by steam, a sharp decline in the production of electricity by water power, and a slight gain in the amount of power imported from Canada. As reported by the United States Geological Survey, the output of fuel-using plants was 62,843,000,000 kWh, as compared with 62,723,000,000 kWh in 1929, a gain of 0.2 per cent. On the other hand, the output of hydro-electric plants decreased from 34,629,000,000 kWh in 1929 to 32,794,000,000 kWh in 1930, a drop of 5.3 per cent. Imports from Canada, as reported by the Dominion Bureau of Statistics, totalled 1,619,600,000 kWh in 1930, as compared with 1,444,000,000 kWh in 1929. The total of all electricity available for the public supply was thus 97,257,000,000 kWh, a decrease of 1,539,000,000 kWh or 1.6 per cent.—*Reuter's Trade Service* (New York).

Ventnor (I.O.W.).—CHANGE-OVER.—The Urban District Council has entered into an agreement with the Isle of Wight Electric Light & Power Co., Ltd., for the change-over of the system from d.c. to a.c. with as little delay as possible. The company has brought the charges in the Ventnor area into line with those in other urban areas in the Island.

Weymouth.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £8,557 for mains, and £489 for sub-station equipment and kiosks, in connection with the supply to Rodwell and Radipole.

Tramway and Railway Notes.

Continental.—SPAIN.—In order to relieve traffic congestion it is proposed to substitute 'buses for tramcars in the centre of Madrid.

Halifax.—TRANSPORT EXPERIMENT.—As an experiment the Town Council is to substitute 'buses for tramcars on certain routes for a period of two months.

Japan.—NEW ELECTRIC RAILWAYS.—The Fukubu Electric Railway and the Mizuhama Electric Car Co. have decided to start work jointly on the construction of two electric railways—one of 1.14 miles in length in Fukui-ken and the other 1 mile in length in Ibaraki-ken.

London.—PROPOSED TUBE EXTENSION.—The Underground Railway Company is asking for powers by means of a late Bill in Parliament to extend the Bakerloo section of the London Electric Railway from the Elephant and Castle, its present terminal, to Camberwell Green. The proposed extension lines will run for a mile and three-quarters with two new stations, one at the junction of Albany Road and Camberwell Road and the other, the new terminal, at Camberwell Green. The cost of the scheme is approximately £1,875,000. If the necessary powers are obtained by August 31st next it is hoped that the new line will be open for traffic at the end of 1933.

Newcastle-upon-Tyne.—TRAMWAY ABANDONMENT PROPOSED.—The Corporation Transport and Electricity Committee reports that the working of the tramways during the year ending March 31st, 1931, will show a deficit of £2,746 though a surplus of £22,216 was expected. The Committee estimated for over £35,000 more revenue from the tramways than has materialised. The income for the year 1931-2 is estimated at £434,099 as compared with an estimate for the year now ending of £473,350. As a result of these not too cheerful prospects a scheme is being taken in hand by Mr. W. C. Percival, chairman of the Corporation Transport and Electricity Sub-committee, which provides for the scrapping of the tramway system, which has already standing against it a debt of £900,000, and the substitution of 200 'buses. The scheme will involve the expenditure of £357,000, but Councillor Percival points out that if the people of Newcastle are willing to pay increased 'bus fares of 15 per cent. above normal tramcar fares for five years to wipe off the tramway debt he believes that the solution to the transport problem will have been found.

Nottingham.—RAILLESS CARS.—The Corporation Transport Committee proposes to commence work shortly on a £900,000 scheme for the conversion of the tramway system to railless traction.

Railway Electrification. — COMMITTEE'S REPORT. — The *Financial News* states that the committee appointed in September, 1929, to consider the question of the electrification of British railways is shortly to present its report to the Minister of Transport. Lord Weir is chairman of the Committee, and the other members are Sir Ralph Wedgwood and Sir William McLintock.

Scarborough.—PURCHASE OF TRAMWAYS.—At a poll held recently ratepayers voted in favour of a Bill now before Parliament which provides, among other things, for the purchase of the tramway undertaking by the Corporation.

Southampton.—NEW TRAMCARS.—Application is to be made by the Corporation Tramways Committee for sanction to the borrowing of £10,000 for new tramcars.

Sunderland.—TRANSPORT EXPERIMENT.—To decide which method of transport is most favoured in the town the Corporation is to run a new up-to-date tramcar on the Tatham Road route in direct competition with the 'buses. This experiment will begin shortly and the service securing the highest receipts will be adopted for the route.

TRAMWAY LOOP-LINE.—The Town Council is to make application to the Ministry of Transport for permission to lay a tramway loop-line to deal with the traffic at Roker, near the football ground.

BOW COLLECTOR SYSTEM ADOPTED.—The Town Council has authorised the present trolley system of the Corporation tramways to be converted to the bow collector system, at an estimated cost of £2,750.

Telegraph and Telephone Notes.

Australia.—POWER-LINE TELEPHONY.—The State Electricity Commission of Victoria recently completed a telephone circuit linking the Commission's offices in Melbourne with its main electricity generating station at Yallourn, the voice channel of which is carried over the line which conveys power at 132,000 volts. A condenser connects each end of the line to the telephone instruments; it is made of thick-walled porcelain, is about five feet high, coated externally and internally with sheet metal, and has a large margin of safety, as 300,000 volts must be applied to it before it will flash over; two are used in series at each end of the line. The system has worked satisfactorily with full load on the transmission line, and even the marked electrical surges developed in the line during thunderstorms have not interrupted it.

Channel Islands.—TELEPHONY.—It was announced in Parliament on February 23rd that it was hoped to open a public telephone service between most of the principal towns of Britain and the towns of St. Peter Port, Guernsey, and St. Helier, Jersey, towards the end of next month.

International Telephony.—LONDON-PRAGUE.—The Postmaster-General announces that, in view of the continued growth of telephone traffic between this country and Czecho-Slovakia, a "through" service between London and Prague has been brought into operation. Calls have hitherto been switched at Berlin.

GERMANY-SWEDEN.—A new submarine cable has recently been laid between Zarrenzin, Germany, and Kampinge, Sweden, a distance of 75 miles. It was manufactured by the Felten and Guilleaume Co., is provided with loading coils, is paper insulated, and sheathed with lead; 42 different conversations can be carried on at one time, or 84 by means of carrier currents.

Philippine Islands. — RADIO SERVICES. — The Governor-General, acting upon the advice of experts appointed to study existing electrical communication services in the islands, will shortly invite tenders for the operation and maintenance of the nine principal radio stations now worked by the administration. Operated under a co-ordinated system, the stations are expected to prove of great commercial value to the islands. Their lease to private organisations (or individuals) is greatly favoured, but, as an alternative, the creation of a semi-government entity is proposed to take over the control of the communication services.—*Reuter's Trade Service* (Manilla).

Ship-to-Shore Telephony.—TYNESIDE.—Telephones for the use of cargo vessels putting in at North Shields have been installed by the Tyne Improvement Commissioners. A lighter has been equipped with connecting cables and portable telephones to connect ships to the local exchange through one of seven transfer stations in various parts of the docks. The fee is only two shillings a day, while no charge is made for local calls; trunk calls are charged for at the usual rates.

The Telephone Service.—CHESTER PROGRESS.—The local Advisory Committee's report for 1930 (North Wales district: Mr. R. A. Weaver, superintending engineer) shows that in the Chester, North Wales, and Hanley areas the number of instruments increased by 2,996 net to 43,077, or 7.4 per cent. The district was served by 334 exchanges, 5 new ones having been completed in the Hanley area, 6 in the Chester and Shrewsbury areas, and one in the Bangor area, besides 17 others that were in hand and the conversion of several manual exchanges to automatic operation. The underground cable mileage increased by 21,944 to 178,935 miles, and overhead lines increased by 4,039 to 72,316 miles. Public kiosks increased by 71 to 224; sub-post office call offices increased by 241, of which 168 were in rural districts, in addition to 36 at railway stations. The number of trunk calls increased by 4.3 per cent. to 4,088,892 and telephoned telegrams increased by 0.38 per cent. to 305,322. Local and junction calls totalled 18,971,824, an increase of 7.7 per cent.

BIRMINGHAM DISTRICT.—This area was served by 88 exchanges, 5 hypothetical ones having been opened during the year, four as a preliminary to conversion to auto-switching. The equipment at 20 exchanges was extended, a new toll exchange was about to be opened, and sites for a number of others had been acquired. The number of instruments was 78,222, a net increase of 4,595. The number of private branch exchanges continued to increase and totalled 3,879 with 29,188 stations; three additional automatic private branch exchanges were installed, making the total 52. The demand for residential service was maintained, 1,447 new stations making the total 16,309. A further 31 rural call offices were opened, the number of kiosks being 573 and call offices 949. Some 60,203,085 local calls were originated during the year, an increase of 1,650,911, while the number of trunk calls dealt with increased from 4,413,924 to 4,437,931. The number of telegrams dealt with by telephone was 894,350, an increase of 40,797.

The Telegraph Service.—"TELEPRINTERS."—The first teleprinter exchange in Europe is being constructed at the General Post Office, London. It is expected to have as many as 1,000 lines and be opened before the end of the year. Subscribers will be charged an inclusive annual rental of about £90 for the installation of the machine (which acts both as transmitter and receiver), for private lines, for maintenance, and for an unlimited service. The caller will dial the number he requires on the telephone in the usual way. Having established connection, he will type out his message, which will appear in typescript at the other end. More than 360 characters a minute can be sent in this manner.

Radio Notes.

Italy.—NEW STATIONS.—The National Broadcasting Committee has decided to construct new stations at Florence and Bari. The power of the existing stations at Milan and Genoa will be increased from 8 and 1 to 60 and 10 kilowatts respectively.

Large Valves.—"OSRAM" WATER-COOLED TYPE.—For many months past the research laboratories of the General Electric Co., Ltd., in conjunction with the M.O. Valve Co., Ltd., have been engaged on the design of new water-cooled valves rated at 100 kilowatts, and the General Post Office has decided to install a bank of them on an experimental basis at its radio station at Rugby. They are the first of their type and size to be entirely designed, developed, and manufactured in England. The anode is a solid copper tube and is kept cool in operation by a jacket through which water circulates at the rate of approximately 500 gallons per hour. The glass parts are directly fused on to the metal parts and a new departure is that the filament leads, owing to the heavy currents they have to carry, are water cooled also. The filament takes 226 amperes at 31.5 volts and 18,000 anode voltage. The valve's length is 3 ft. 6 in., it weighs from 18 to 20 lb., and its anode diameter is 4 in.

Licences.—YEAR'S INCREASE.—During 1930 some 3,501,007 receiving licences were issued, an increase of 500,000 licences during the twelve months, excluding the 19,942 issued free to blind people. Assuming four listeners per licence to be the average, there were thus 14 million listeners in the British Isles, an increase of two millions during the year.

Norway.—NEW STATION.—The inaugural programme of Bodö was relayed by the Oslo transmitter on February 15th. The new plant is the most northerly in Europe, being within the arctic circle, 300 miles north of Trondhjem and some 1,500 miles from London.

Russia.—NEW STATIONS.—The Soviet Government is to construct six new stations to serve the Far East. Some of them are to be completed this year and some of them next. They will be strong enough to be heard in India and Africa.

Turkey.—NEW TRANSMITTER.—The great mosque of Saint Sophia in Constantinople, one of the most historic buildings in the world, is reported to have been converted into a broadcasting station. The four minarets are used to support the aerial and the nave is used as the studio. It is understood that the transmitter will be employed mainly for Mahommedan propaganda.

United States.—RECEIVERS.—There are 13,478,000 listeners in America, according to the latest return issued by the United States Board of Trade. A feature of the return is that the number of radio sets is proportional to the number of motor cars. The states of New York, California, and Illinois have the largest numbers of receivers, while Nevada comes last with the smallest number.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MILDURA (VIC.).—March 14th. Town Council. 1,000-kW steam turbo-generator and equipment. (A.X. 10766.)*

Aylesbury.—March 2nd. Electricity Department. General stores for twelve months. (February 13th.)

Belgium.—IXELLES.—March 5th. Municipal authorities. Mercury rectifier sets for the Rue Americaine transformer station. Particulars (Cahier des Charges) for 5 fr. 70 c. from Service de l'Electricité, 20 Rue d'Alsace-Lorraine, Ixelles. Tenders to Hotel Communal, Ixelles.

BRUSSELS.—The Société Nationale des Chemins de Fer Belges announces that it will shortly be inviting a limited number of tenders for the supply of eight electric capstans. Firms desirous of being taken into consideration should communicate with the Service du Materiel, S.N.C.F.B., Division les Achats, Bureau 26-5, 21, Rue de Louvain, Brussels.

Blackburn.—March 9th. Electricity Department. Cable, wire and meters. (February 13th.)

Blackpool.—Corporation Baths Committee. Public address and music reproducing apparatus. (February 13th.)

Bradford.—March 5th. Corporation. Two water-tube boilers. (February 13th.)

Brighton.—March 5th. Tramways Department. Two tons of trolley wire, 3,000 tungsten filament lamps, and 500 yards of plain lead-covered cable. Specifications and forms of tender from the Office of the Tramways Engineer, Lewes Road. Tenders to Mr. J. H. Rothwell, town clerk, Town Hall.

Bromley (Kent).—March 16th. Corporation. Wiring of houses on the Southborough housing estate. (See this issue.)

Cardiff.—March 9th. Electricity Department. Transformer, switchgear, and cables. (February 13th.)

Dundee.—March 11th. Electricity Department. Coal and ash handling plant. (February 20th.)

Edinburgh.—March 12th. City Council. Underground cables, conduits, fuse boxes and boards, meters, link disconnecting boxes, &c. (February 13th.)

Egypt.—CAIRO.—April 18th. Ministry of the Interior. Ice-making plant and accessories. (A.X. 10785.)*

April 15th. Ministry of Public Works. Diesel-electric propelling machinery for Seru oil tanker. Copy of specification and conditions of tender can be obtained from the Office of the Director-General, Mechanical and Electrical Department, against payment of 250 mills.—*Reuter's Trade Service* (Cairo).

Erith.—March 6th. Electricity Department. H.p. and l.p. underground cables, joint boxes, meters, cut-outs, &c. (See this issue.)

Fareham (Hants).—March 14th. Knowle Mental Hospital. Pumps, booster, switchboard, cables, &c. (See this issue).

Fleetwood.—March 2nd. Electricity Department. Rotary convertors, transformers, and switch panels. (February 13th.)

Glasgow.—March 4th. Commissioners of H.M. Works. Installation of a water heating installation at new Central Employment Exchange and Inland Revenue Building, Waterloo Street. Forms of tender (£1 1s.) from engineer, H.M. Office of Works, 122, George Street, Edinburgh.

Heston and Isleworth.—March 6th. Electricity Department. H.p. cables, rectifier, transformer and switchgear. (February 20th.)

London.—CENTRAL ELECTRICITY BOARD.—March 2nd. Central indication and telephone equipments in connection with the South-East England Electricity Scheme. (January 16th.) Construction of central control station building at Leeds in connection with the Mid-East England Electricity Scheme. (February 6th.)

March 9th. 33-kV overhead transmission lines in connection with the North-West England and North Wales Electricity Scheme. (January 30th.)

March 16th. Construction of site works, foundation works and buildings at Barton and Warrington in connection with the North-West England and North Wales Electricity Scheme. (February 20th.)

HAMMERSMITH.—Electricity Department. Air-cooled transformers. (February 20th.)

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—March 18th. Condenser tubes in connection with the Barking power station extensions. (February 20th.)

April 1st. Boiler house coal-handling plant in connection with the Barking power station extensions. (February 20th.)

Long Eaton.—March 12th. Electricity Department. Twelve months' supply of cables, meters, cut-outs, &c. (February 20th.)

Milford Haven.—March 14th. Electricity Department. Electrical materials, including meters. (See this issue.)

New Zealand.—WELLINGTON.—Public Works Department. April 28th. 5,000-kVA 66/33-kV transformer bank for Lake Coleridge power development. (A.X. 10768.)*

Post and Telegraph Department. April 2nd. 880 yards of lead-covered telephone cable. (A.X. 10769.)*

Plymouth.—March 14th. Corporation. E.h.p. switchgear. (See this issue.)

Portsmouth.—March 18th. Corporation. Installation of electric lighting at sewage collecting tanks, near Fort Cumberland. (February 20th.)

Electricity Department. Three months' supply of l.p. cables. (See this issue.)

Rhondda.—March 28th. Electricity Department. Meters, copper wire, joint boxes, cut-outs, &c. (See this issue.)

South Africa.—BARBERTON.—March 12th. Municipal Council. Hydraulic pipe line and hydro-electric generating set of 150 kW. (G.X. 10074.)*

PORT ALFRED.—March 14th. Municipal Council. Electrical plant, including engines and alternators, steel poles, copper wire, insulators, switchboard, meters, house service fuses, and street lighting suspension fittings.

Stoke-on-Trent.—March 11th. Electricity Department. Twelve months' supply of mains, cables, static transformers, and e.h.p. truck-type switchgear. Also battery for electric vehicle. (February 20th.)

Thornton (Fife).—March 9th. Fife County Council. Installation of electric lighting in 20 houses. Schedules, &c., from Mr. William Williamson, architect, Kirkcaldy (deposit £1 1s.). Tenders to Mr. J. M. Mitchell, county clerk, Cupar.

Warrington.—March 2nd. Health Committee. Private automatic telephone apparatus at the General Hospital. (See this issue.)

March 9th. Electricity Department. Motors and transformers. (February 20th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Caine.—Town Council. Accepted:—
Overhead line for the extension of the electricity supply (£408).—Western Electric Supply Co.
Cable.—Morement & Bridges.

Croydon.—Electricity Committee. Recommended:—
Switches (£995).—A. Reyrolle & Co., Ltd.
Two 250-kW transformers (£484).—British Electric Transformer Co., Ltd.
Two 1,000,000-kVA rupturing capacity switches (£12,150) and one 1,200-amp. switch and control panel (£5,550).—English Electric Co., Ltd.

East Ham.—CORRECTION.—Electricity Committee. Recommended (see our last issue):—
Two h.p. switch panels at generating station (£1,174).—A. Reyrolle & Co., Ltd.
Accepted:—
Switchgear (£9,500, less an allowance of £2,285 for existing switchgear).—A. Reyrolle & Co., Ltd.

East Lothian.—County Council. Accepted:—
Electric lighting installation in connection with extensions and new buildings (£493).—James Foggo & Son.

Glasgow.—Corporation Housing Committee. Accepted:—
Electrical installation for 14 houses and 11 shops at Gallowgate re-housing scheme (£70).—A. Robertson.

Government Contracts.—The following contracts were placed by the various Government Departments during January:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Motor alternators.—Haslam & Newton, Ltd.
Electric bells.—Bonnella Bros., Ltd.; Engineering and Lighting Equipment Co., Ltd.; Hawkers, Ltd.; W. McGeoch & Co., Ltd.
Electric cable.—Connollys (Blackley), Ltd.; Croydon Cable Works, Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.
Electric capstans. Babcock & Wilcox, Ltd..
Inert cells.—Fuller Accumulator Co. (1926), Ltd.; General Electric Co., Ltd.

Secondary cells.—London Battery and Cable Co., Ltd.
Table fans.—General Electric Co., Ltd.
Electric light fittings.—Edison Swan Electric Co., Ltd.; Engineering and Lighting Equipment Co., Ltd.; Gabriel & Co., Ltd.; General Electric Co., Ltd.; Kensington Stamping Co., Ltd.; W. McGeoch & Co., Ltd.; Player, Mitchell & Breeden; Rainsford & Lynes, Ltd; Revo Electric Co., Ltd.; Veritys, Ltd.
Electric lamps.—General Electric Co., Ltd.
Lampholders.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Samuel Heath & Sons, Ltd.; W. McGeoch & Co., Ltd.; Rainsford & Lynes, Ltd.; Sperryn & Co.; Player, Mitchell & Breeden.
Lamp glasses, shades, &c.—Butterworth Bros., Ltd.; Hailwood and Ackroyd, Ltd.; Josiah Lane & Sons, Ltd.; S. & W. (Lighting), Ltd.
Telephone leads.—Ward & Goldstone, Ltd.
Electric lift.—A. & P. Stevens, Ltd.
Motor alternator sets and spares.—Small Electric Motors, Ltd
Electric radiators.—Edison Swan Electric Co., Ltd.
Resistances for electric welding.—Allen West & Co., Ltd.
Switchgear.—Ferguson, Pailin, Ltd.; Erskine, Heap & Co., Ltd.
Electric travellers.—Isles, Ltd.
W/t tuner amplifiers and coils.—Radio Instruments, Ltd.

War Office.

Generating sets.—Ruston & Hornsby, Ltd.

Air Ministry.

Generators.—Haslam & Newton, Ltd.; Mortley, Sprague & Co., Ltd.; M-L Magneto Syndicate, Ltd.
Receivers.—Siemens Bros. & Co., Ltd.
Valves.—Mullard Radio Valve Co., Ltd.

Crown Agents for the Colonies.

Automatic exchanges.—General Electric Co., Ltd.
Cable.—British Insulated Cables, Ltd.; Macintosh Cable Co., Ltd.
Electric motors.—Lancashire Dynamo and Motor Co., Ltd.
Electrical materials.—Chloride Electrical Storage Co., Ltd.
Lightning arrestors.—Siemens Bros. & Co., Ltd.
Telephone switchboards.—Ericsson Telephones, Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.

General Post Office.

Protective apparatus.—Automatic Telephone Mfg. Co., Ltd.; Telephone Manufacturing Co. (1929), Ltd.
Telephonic apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; Siemens Bros. and Co., Ltd.; Standard Telephones and Cables, Ltd.; Telephone Manufacturing Co. (1929), Ltd.
Wireless apparatus.—Standard Telephones and Cables, Ltd.
Telephone cabinets.—Boulton & Paul, Ltd.
Cable.—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; General Electric Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Submarine cable.—Siemens Bros. & Co., Ltd.; Telegraph Construction and Maintenance Co., Ltd.
Dry cells.—Ever-Ready Co. (Great Britain), Ltd.; Fuller Accumulator Co. (1926), Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Secondary cells and parts.—D.P. Battery Co., Ltd.; Edison Swan Electric Co., Ltd.; Hart Accumulator Co., Ltd.
Vacuum cleaners.—British Vacuum Cleaner and Engineering Co., Ltd.
Telephone cords.—Phœnix Telephone and Electric Works, Ltd.
Earth plates.—Locke, Blackett & Co., Ltd.
Tungar rectifiers.—Edison Swan Electric Co., Ltd.
Covered wire.—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; Reliance Electrical Wire Co., Ltd.
Batteries—enlargement.—Taplow (Bucks.) telephone repeater station.—Pritchett & Gold & E.P.S. Co., Ltd.
E.h.p. transformers, oil switch fuse units. &c. (G.P.O. (North), E.C.1).—Drake & Gorham, Ltd.
Electric lighting (York new station sorting office).—Arthur R. Farrar and Co.
Power plant (Leicester telephonic repeater station).—Haslam & Newton, Ltd.
Telephone exchange equipment.—Eccles East, Broughton, Cheetham Hill (Manchester area); Amherst, Regent, Grosvenor, Langham, Mayfair (London area); Ashton-under-Lyne (Manchester). Automatic Telephone Mfg. Co., Ltd. Sub-contractors for Mayfair and Ashton-under-Lyne: Electric Construction Co., Ltd., for motor generator sets and ringing machines; Alton Battery Co., Ltd., for batteries Gatley (Manchester area), Chislehurst (Kent): General Electric Co., Ltd. Sub-contractors: Crompton Parkinson, Ltd., for motor generator sets and ringing machines; D.P. Battery Co., Ltd., for batteries. Orpington (Kent): Siemens Bros. & Co., Ltd. Sub-contractors: English Electric Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines; Hart Accumulator Co., Ltd., for batteries. Tulse Hill (London area): Siemens Bros. & Co., Ltd. Sub-contractors: English Electric Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines: Chloride Electrical Storage Co., Ltd., for batteries.
Telephonic repeater equipment (Manchester).—Standard Telephones and Cables, Ltd.

Isle of Wight.—County Council. Accepted:—

Crude oil-driven generating set for the mental hospital (£346).—Ruston & Hornsby, Ltd.

London.—L.C.C.—Highways Committee. Accepted:—

Eight electrically-propelled exhaust propeller fans for Rotherhithe Tunnel (£2,234).—James Keith & Blackman Co., Ltd. Sub-contractors: Greenwood & Batley, Ltd., for motors; G. Ellison, Ltd., for switchgear.

Two centrifugal blowing fan sets for Rotherhithe Tunnel:—

	£
John Thompson (Dudley), Ltd.	1,390*
Standard & Pochin Brothers, Ltd.	2,220*
Musgrave & Company, Ltd.	2,382
Alternative tender	2,424
Howden-Ljungstrom Preheaters (Land), Ltd. ...	2,455
Alternatives for different makes of motors and starters 2,530, 2,550,	2,640
Harland & Wolff, Ltd. (Accepted)	**2,503**
Alternative for different make of motor and starter	2,578
Entwisle & Gass, Ltd.	3,150
J. Keith & Blackman Co., Ltd.	3,690

* Not in accordance with specification.

In view of the greater capacity of the fans which would be supplied, and the lower consumption of electrical energy, the Committee has accepted the tender of Harland & Wolff, Ltd., amounting to £2,578. The company proposes to sub-let work as follows:—Howden Ljungstrom Preheaters (Land), Ltd., for blowing fans; Crompton Parkinson, Ltd., for electric motors; Allen, West & Co., Ltd., for switchgear.

Stepney.—Electricity Committee. Recommended:—
Steam pipework for Limehouse power station (£1,650).—Babcock & Wilcox, Ltd.

St. Pancras.—Contracts and Stores Committee. Recommended:—
660-V, paper-insulated, l.c. and armoured cables.—Metropolitan Electric Cable & Construction Co., Ltd. (£909); Croydon Cable Works, Ltd. (£447).

Hammersmith.—Electricity Committee. Recommended:—
Cable (£583).—Derby Cables, Ltd.
Metal-clad switchgear (£782).—J. G. Statter & Co.
Two 1,500 kVA transformers (£798).—Hackbridge Electric Construction Co., Ltd.
Electrical fittings for showroom and offices and outside floodlighting (£272).—General Electric Co., Ltd.

The General Electric Co., Ltd., has secured a large contract for the supply of Osram lamps to the Admiralty.

Leeds.—Assistance Committee. Accepted:—
Electric lamps (£239).—British Thomson-Houston Co., Ltd.
Electricity Committee. Accepted:—
Sub-station panels (£173).—H. J. Fuller & Sons.
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£354); Enfield Cable Works, Ltd. (£670); Macintosh Cable Co., Ltd. (£810); Edison Swan Cables, Ltd. (£357); Croydon Cable Works, Ltd. (£756).

Leybourne.—Kent County Council. Accepted:—
Electricity supply to Grange Sanatorium:—
Laying cables (£241).—Kent Electric Power Co.
Wiring, &c. (£56).—Oswald Jones & Co.

Mytholmroyd.—Urban District Council. Accepted:—
Installation of electric lighting at 22 houses at Caldene.—Oakley, Green & Wilson.

Seaham Harbour.—Housing Committee. Accepted:—
Wiring 104 houses on Carr House estate.—Harrison Bros.

Southend-on-Sea.—Town Council. Accepted:—
340 yd. submarine cable (£95).—Union Cable Co., Ltd.
Overhauling electric lighting installation at the Floral Hall (£113).—F. P. Richard & Co.

Forthcoming Events.

Bristol Electric Club.—Friday, February 27th. Crown Rooms, Bristol. 7.15 p.m. Address by Mr. J. W. Beauchamp.

Birmingham Electric Club.—Friday, February 27th. Grand Hotel, Birmingham. 7 p.m. "Electricity Supply Metering and Methods of Charge." Mr. W. Lawson.

Electrical Power Engineers' Association (London Local Group).—Saturday, February 28th. Café Royal, Regent Street, W. 7-12 p.m. Annual dinner and dance.

Nottingham Society of Engineers.—Monday, March 2nd. Welbeck Hotel. 7.30 p.m. "Recent Developments in Mine Lighting." Prof. W. H. McMillan.

Institution of Electrical Engineers.—Monday, March 2nd. Institution, London. 7 p.m. Informal meeting. Discussion on "Earthing *versus* Artificial Earthing." Opened by Mr. T. C. Gilbert.

(North-Eastern Students' Section).—Friday, February 27th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Lecture. "Overhead Line Work—More Especially in Connection with the Grid." Mr. F. J. Baldwin.

(West Wales (Swansea) Sub-Centre).—Friday, February 27th. Electricity Offices, Swansea. 6 p.m. "The Medical and Surgical Applications of Electricity." Mr. B. Leggett.

(South Midland Centre). — Monday, March 2nd. University, Birmingham. 7 p.m. "Surge Investigations on Overhead Line and Cable Systems." Messrs. S. W. Melsom, A. N. Arman, and W. Bibby.

(Western Centre).—Monday, March 2nd. Bristol. "Heavy Duty Rectifiers and their Application to Traction Sub-stations." Messrs. J. W. Rissik and H. Rissik.

(East Midland Sub-Centre).—Tuesday, March 3rd. College of Technology, Leicester. 6.45 p.m. "Phenomena Connected with the Collection of Current from Commutators and Slip Rings." Mr. H. G. Taylor.

(South Midland Students' Section).—Tuesday, March 3rd. University, Birmingham. 7 p.m. "Electric Traction." Lt.-Col. H. E. O'Brien.

(North-Western Students' Section).—Tuesday, March 3rd. Engineers' Club, Manchester. Annual smoking concert.

(London Students' Section).—Tuesday, March 3rd. Institution, London. 6.15 p.m. Address by the president, Mr. C. C. Paterson. Saturday, March 7th. 2.30 p.m. Visit to "Daily Mirror" Newspapers, Ltd., Fetter Lane, E.C.4.

(Wireless Section).—Wednesday, March 4th. Institution, London. 6 p.m. "The Practical Correction of a Wireless Direction-Finder for Deviations due to the Metal Work of a Ship." Mr. C. E. Horton.

(Meter and Instrument Section).—Friday, March 6th. Institution, London. 7 p.m. "The Electrical High-pressure Testing of Cables and the Localisation of Faults." Mr. J. Urmston.

(North Midland Students' Section).—Saturday, February 28th. 2.30. p.m. Visit to Leeds Corporation power station.

Royal Society of Arts.—Wednesday, March 4th. Adelphi, London. 8 p.m. "Safety in Factories." Sir G. Bellhouse, H.M. Chief Inspector of Factories.

Institute of Transport.—Thursday, March 5th. Connaught Rooms, W.C. Annual dinner.

Institution of Chemical Engineers.—March 5th and 6th. Ninth annual meeting and annual dinner.

Leeds Electrical Club.—Friday, March 6th. Members' dinner at the Leeds and County Conservative Club. 6.30 for 7 p.m.

Association of Mining Electrical Engineers (London Branch).—Saturday, March 7th. 1.15 p.m. Visit to Messrs. Fuller's Works at Walthamstow.

(Western Sub-Branch). — Saturday, March 7th. Swansea. "Drives on Electrical Machinery in Mines." Mr. C. E. Yates.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

A wiring system for c.t.s. type cable employing a protecting trough similar to that used in the old capping and casing system. The wires are first laid against the wall, and the cover of wood or some form of fibre is then laid over the wires in long lengths, and screwed to the wall.

FORWARD food conveyors.

SUN-KIST fruit juice extractors.

TXO hairdryers.

A P B fires.

TYPE H (with design) electrically-heated pillow.

APOLLO vacuum cleaner.

VORTEX vacuum cleaner.

Notes.

Faraday House Scholarships.

The annual examinations for a Faraday scholarship of 80 guineas per annum, tenable for two years in college and one year in manufacturing works, and for a Maxwell scholarship of sixty guineas per annum, tenable for two years in college and one year in works, will be held at Faraday House on March 31st, April 1st and 2nd, 1931. Exhibitions may also be awarded to candidates who acquit themselves creditably in the above examinations, but who do not obtain the necessary number of marks to qualify for the Faraday or Maxwell scholarships. The subjects of examination for the Faraday scholarship are geometry, algebra, trigonometry, dynamics, statics and hydrostatics, geometrical and freehand drawing, chemistry, and physics. For the Maxwell scholarship the subjects are mathematics, dynamics, statics, and hydrostatics. Further particulars may be obtained from the Registrar, Faraday House Electrical Engineering College, 62-70, Southampton Row, London, W.C.1.

Leeds Electrical Club.

The president, Mr. C. Nelson Hefford, M.Sc., M.I.E.E., announces that a members' dinner is to be held on March 6th at the Leeds and County Conservative Club. Tickets (7s. 6d. each) are obtainable from the hon. secretary, Mr. S. T. Needham, Britannia House, York Place, Leeds.

Electric Traffic Control.

An announcement was issued last week by the Ministry of Transport of new regulations to be brought into force in Oxford Street, London, in order to secure greater safety and a quicker flow of traffic in the thoroughfare. A system of traffic control known as the "flexible progressive system" is to be introduced between Marble Arch and St. Giles' Circus. By this means the progress of vehicles will be so regulated that a continuous flow of traffic will take place along the whole length of the thoroughfare at a set speed. For the safety of pedestrians it is further proposed that the signals employed should be of the "three-way" type, to which pedestrians have one signal in view directly ahead in whichever direction they cross.

The Electrical Association for Women.

On February 5th an interesting display of electrical films was given at the E.L.M.A. Lighting Service Bureau, London, a special feature of which was the E.A.W. film showing the electrical flat at the recent Bachelor Girl's Exhibition. Mr. Lawrence gave a short talk on the value of "Electrical Films in Educational and Propaganda Work." The annual conference of the Association will be held in Glasgow on June 4th and 5th, when a civic reception will be given by the Glasgow Corporation, and a visit will be paid to the Clyde Valley hydro-electric scheme. The conference will be largely concerned with education in electricity, and women speakers are expected from the Scandinavian countries. The annual luncheon and ball will be held in London on April 17th.

On February 11th an interesting visit was paid to the dairy of the Birmingham Co-operative Society by members of the Birmingham and Midlands Branch.

A large party of members visited the new West Ham electricity offices and showrooms on February 11th. In proposing a vote of thanks to the West Ham Electricity Committee, Mrs. G. Z. de Ferranti referred to the electrical farm which she is equipping near London, and said she only wished the farm could be placed somewhere in West Ham.

At the invitation of the Hampstead Garden Suburb Institute, a lecture entitled "Let There be Light" was given by Miss Noakes, of the E.L.M.A. Lighting Service Bureau on February 11th. Miss Noakes showed the value of decorative and artistic lighting in the home.

The second annual meeting of the North Staffs. branch of the Association was held on February 19th at the Stoke-on-Trent electricity showrooms. Mrs. Leese, wife of the chairman of the Stoke Electricity Committee, was re-elected president of the branch. Mr. G. S. Francis, of the British Electrical Development Association, spoke on "The History and Development of Electricity."

Appointments Vacant.

Temporary assistant for testing electrical equipment for the Air Ministry.

Mains assistant for the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board.

Mains superintendent for Taunton Electricity Department.

Clerk and temporary showroom assistant for Fulham Electricity Department.

(See our advertisement pages to-day.)

French Railway Electrification.

At a recent meeting of the French Society of Civil Engineers papers were read on the present state of the electrification work on the Midi and Orleans Railways of France. M. Bachellery, who dealt with the Midi railway, stated that out of the total of 2,682 miles of the system, electric trains were now running over 758 miles, and in the near future that figure would be increased to 1,164 miles. The chief sections which had been electrified were those between Bordeaux and Hendaye, between Bedous and Canfranc, and between Aix-les-Thermes and Puigcerda, while work was in progress in converting the Beziers-Neusargues, Bordeaux-Pointe de Grave, and Montauban-Sete sections. The Midi Co. obtained its electric power supplies from its own five hydro-electric installations, which had a capacity of 400 million kWh per annum, but were at present supplying only about 200 million kWh. The power equipments generated 50-cycle, a.c., which was converted for train operation to 1,500 volt d.c. at sub-stations located every 12½ to 15 miles. Twenty-seven of the stations were automatic, the automatic working being, however, confined to the starting and stopping of the groups of convertors, the h.p. control gear being hand-operated.

The rolling stock comprised about 200 electric locomotives, each of 1,400 h.p., with four driven axles, and capable of attaining a maximum speed of 56½ m.p.h., and ten 2,100-h.p. engines with three driven axles and a speed up to 75 m.p.h. On the local lines combined 500-h.p. locomotives and carriages were used. Of the total annual train-milage of the whole Midi system of 21,875,000, some 7¼ million train-miles, or approximately one-third, was effected by electric locomotives. M. Bachellery reported that as a result of the electrification, not only had the average speed of the trains been increased, but owing to the low cost of power, it had also been possible to increase the number of trains without undue expense. The load carried was higher, trains were keeping better time, while traffic derangements were no more numerous than with steam traction. As regarded the cost of the electrification work, roundly £2,480,000 had been spent on power stations, £1,480,000 on 150,000-V transmission lines, and £4,624,000 on 60,000-V lines, sub-stations, and contact lines, the total of £8,584,000 involving an annual cost of £736,000. As against this, £408,000 was being saved in coal, £120,000 in engine and other upkeep,

while £240,000 was being earned by the supply of power to third parties from the generating stations, a total of £768,000. Thus on balance the electrification showed an annual saving of £32,000.

M. Parodi, who dealt with the Orleans Railway, did not go into details of the electrification work completed on that system, but confined his remarks to the results obtained. Thus, he stated that the necessary power was obtained from two steam-operated generating stations and two hydro-electric installations, all of which were interconnected by 150,000/220,000-V lines and also connected to 90,000-V transformer stations feeding the convertor stations, in which the system was changed to 1,500 V d.c. Electric trains were running on the Paris-Vierzon and Bretigny-Dourdan sections, a total of 147 miles, representing about 625 miles of track. About 300 trains per day were run in the Paris area, and 50 in the Vierzon district, the average train weight being 600 tons. In 1929 the total train weight hauled exceeded 3,125 million ton-miles; the power stations and electrical equipment of the lines were, however, capable of dealing with 5,312½ million ton-miles per year. The eleven sub-stations were located at every 7½ miles in the Paris area and every 15½ miles in the Orleans-Vierzon district. They each comprised groups of 1,000-kW 750-V convertors connected in series of two. The rolling stock comprised eighty 700-h.p. combined locomotives and coaches, two hundred 1,700-h.p. locomotives, and five express engines of three different types.

Television.

In a recent lecture before the Television Society in London Mr. E. L. Gardiner described the "Stenode Radiostat" principle and its application to television as a means of avoiding interference with broadcast radio-telephony transmission and reception.

It is reported that the General Electric Co. of America has been experimenting with short-wave television across the Atlantic Ocean in co-operation with Professor Karolus, of Leipzig University, Germany.

The Institution of Engineers, Australia.

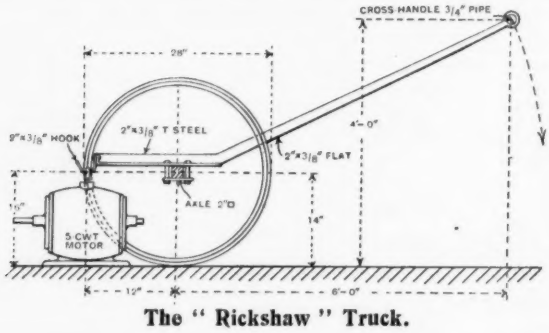
Mr. E. S. Maclean, the secretary of this Institution, informs us that the headquarters was removed in January to Science House, 157-161, Gloucester Street, Sydney, N.S.W.

A Medical Train.

The Northern Railway of France, which has already created garden cities with a total of 40,000 inhabitants for its servants and their families, has now organised a medical train for the special benefit of its staff. The *Railway Gazette* states that the train consists of two corridor coaches, one containing a waiting room, two dressing rooms, a consulting cabinet, an X-ray room communicating with a developing cabinet, and an analytical laboratory. The second coach is used for lodging the medical staff. The necessary electric current is provided by the stations at which the train stops. A few days before its arrival the staff in the district is notified, so that advantage may be taken of its passage. Patients can not only have an X-ray examination, but can also undergo blood tests, bacteriological analyses, and, generally speaking, all the operations that go to make up a medical consultation.

Truck for Lifting and Transporting Motors.

The "Rickshaw" truck shown in the accompanying sketch has been designed and put into service by Mr. J. T. Towlson for the purpose of speedily lifting, and just as speedily transporting, small motors, generators, and the like, in the repair



The "Rickshaw" Truck.

shops and around the purlieus of a large factory. Compared with the old-fashioned means, it is, not infrequently, a case of minutes *versus* hours.

The old-fashioned means are well known: a four-wheeled truck, two men and a boy to lift and lash a machine on to the four-wheeler, and then two men and a boy to lift it off.

The "Rickshaw" has a hooking appliance, six-to-one lifting ratio, and 28-in. Sorbo-tired wheels; the hook catches the eye-bolt of the machine to be moved, lifting it easily from the ground and setting it down where desired, the whole operation being performed very quickly. The sketch gives a general view of a "Rickshaw" suitable for lifting motors and generators up to and even above 5 cwt. The axle is shown in section. The wheels have a base of 1½ in. diameter and the axle journals are 4 in. long.

Larger motors and generators may be lifted and transported in a similar way if the parts are adequately strengthened and lever ratio is suitably increased.

Swan Memorial Appeal.

Efforts towards the tangible recognition of the work of Sir Joseph Wilson Swan (1828-1914), a man of rare genius, a pioneer of photography, and the inventor of the electric incandescent lamp, are taking the form of the presentation by the Institution of Electrical Engineers of a bronze tablet to the Borough of Sunderland for erection in the entrance hall of its Central Public Library, Museum, and Art Gallery. A committee representative of the town of his birth and the I.E.E., of which he was president in 1898, is also appealing for not less than £5,000 with which to found a National Swan Memorial Scholarship in Electrical Engineering Science. The fund is to be administered by the I.E.E. and the appeal is supported by the Royal Photographic Society of Great Britain. Donations already announced include the following:—

	£
Sunderland Forge and Engineering Co., Ltd. ...	250
Electric Lamp Manufacturers' Association of Great Britain, Ltd.	500
C. A. Parsons & Co., Ltd.	250
Merz & McLellan	105
Newcastle-upon-Tyne Electric Supply Co., Ltd. ...	250
Kensington and Knightsbridge Electric Lighting Co., Ltd.	105
Crompton, Parkinson & Co., Ltd.	105
A. Reyrolle & Co., Ltd.	105
Sir James Laing & Sons, Ltd.	105
J. H. Holmes & Co., Ltd.	25
Wm. & T. R. Milburn	25
Joseph L. Thompson & Sons, Ltd.	105
Mawson Swan & Morgan, Ltd.	25
	£1,955

His early acquaintance with Swan induced the late Sir Charles A. Parsons to joint "absolutely with James Swinburne and Sir Ambrose Fleming when they testify to the great technical skill and patience which Swan employed in the epoch-making invention. . . . . It is beyond question that Swan . . . gave us the incandescent electric lamp in its earliest practical form." Mr. C. C. Paterson, in likewise commending the appeal, feels sure that "the proposed memorial is that which Swan himself would have liked."

Subscriptions should be sent to the hon. treasurer of the fund: Mr. E. T. Nicholson, Martin's Bank, Ltd., Fawcett Street, Sunderland, or to the secretary of the I.E.E., Mr. P. F. Rowell, Savoy Place, Victoria Embankment, London, W.C.2.

"The Electric Sign."

We regret that Mr. J. Montague Woolnough, the author of the article bearing the above title which appeared in our last week's issue, was incorrectly described as chairman of the Electrical Section of the Master Sign Makers' Association. Mr. Woolnough is a member of that section (of which Mr. J. H. Pearce is chairman) and is chairman of the Propaganda Com-Committee of the Association; he was also organiser of the recent mobile exhibition of electric signs.

The A.S.E.E. Dinner.

The annual dinner of the Association of Supervising Electrical Engineers was held on February 21st at the Hotel Great Central, London, N.W. The president, Mr. S. B. Donkin, took the chair, and the company numbered about 260. The first toast after that of H.M. the King was "The Electrical Industry," which was proposed by Sir John Brooke, C.B. (deputy chairman, Electricity Commissioners), who noted the absence from the toast list of the customary item relating to the Association itself. He said that he had been informed that the omission was due to the Association regarding itself as one with the industry. Although the electrical industry had been called the one bright spot and electricity consumption had increased by 5½ per cent. last year, as compared with actual declines in Germany and the U.S.A., it had no right to be proud. In our most important industrial districts there had also been decreases, and the increase was only maintained because in South-East England the increase was 16 per cent., largely due to the growth of domestic load. That meant that electricity was not helping appreciably to provide additional employment in other industries. Electricity by itself could not revive industry, but it was a necessary factor in a revival. It was the duty of the practical electrical engineer to show other industries how to employ power properly and more freely, since the future lay with the country using the most power. In the U.S.A. 4½ h.p. was used per worker, but in Great Britain only 2¼ h.p. was used, and our great industries compared unfavourably with those of other countries in electrification.

Mr. C. C. Paterson (president, I.E.E.), responding, claimed for the electrical industry that, as a comparative newcomer, it was not handicapped with the evil traditions of the Victorian era, *viz.*, suspicion in human relations and empiricism in technical aspects. Success would depend upon the adoption of, and not mere lip service to, the scientific outlook, not only on new

processes, but also on old ones. The late Sir Charles Parsons had the gift (very rarely found together in the same individual) of combining a critical and enquiring outlook with courageous enterprise. Generally we needed three men operating in common: the engineer, the scientist, and the commercial man; each would improve his value from association with the others.

MR. S. B. DONKIN (president, A.S.E.E.) proposed the health of the guests, referring to the many eminent men present by name. He also paid a tribute to the helpful interest in the Association shown by the technical Press (this is only another way of saying that the technical Press shows its interest in the good of the electrical industry). He said that the increase in the membership of the Association during the 2¼ years in which he had been president had been at the rate of 25 per cent. per annum.

SIR WILLIAM NOBLE responded. His speech consisted of a series of stories of the kind that Scotsmen invent about Scotsmen for the amusement of southerners, thus belying the quaint superstition regarding the sense of humour of inhabitants of the northern portion of our island.

MR. G. SCOTT RAM also responded. As president-elect of the Association, he expressed the hope of learning much from its members when he succeeded Mr. Donkin in office.

MR. W. E. HIGHFIELD (past president, A.S.E.E.) presented the Highfield Shield and other prizes for the best papers sent in during 1930 (see ELECTRICAL REVIEW, January 30th, 1931).

MR. F. W. SMITH (chairman, A.S.E.E.) gave some particulars of the Association's work and aims. The basis of the A.S.E.E. since its formation in 1914, he said, had been education. It was successful because it exacted a standard of qualification from its members and because it received their active support.

E.P.E.A. Dinner.

The Scottish Division of the Electrical Power Engineers' Association held its annual dinner in the Caledonian Hotel, Edinburgh, on February 14th. Mr. N. B. McArthur, A.M.I.E.E., presided over a company of 70 members and friends. Mr. E. Seddon, M.I.E.E. (chief engineer, Edinburgh Corporation Electricity Department) proposed the toast of the evening, that of the Association. Mr. Seddon referred to the great changes which had taken place in the status of charge engineers. Twenty or thirty years ago they were mostly placed on the weekly pay roll, and their position was generally considered to be inferior to that of the station foreman. The membership of the Association was now 4,588, an increase of 169 members compared with the previous year. In conclusion, Mr. Seddon put forward a plea for closer joint working between the Association of Municipal Electrical Engineers and the E.P.E.A. Those two bodies, he considered, could not remain isolated indefinitely if maximum benefits were to be secured.

Mr. A. E. Ricketts, A.M.I.E.E. (president, E.P.E.A.) replied. He said he believed the younger members of the Association would be much more keen to keep the Association alive if they realised what were the conditions before a few men set about remedying matters, and that what had been won might "take some keeping." Speaking of co-operation between their Association and the Association of Municipal Electrical Engineers, Mr. Ricketts said that that was not only desirable but, he thought, would become necessary. Other speeches were given by Mr. H. J. Taylor, A.M.I.E.E., Mr. D. Maxwell Buist, M.I.E.E. (district engineer, north-eastern area of the C.E.B., and a former member of the Edinburgh Corporation Electricity Department).

E.D.A. in the Midlands.

An informal dinner was given by the South Midland Area Committee of the E.D.A. to the parent Council on February 24th, at the Queen's Hotel, Birmingham. Mr. G. H. Lake (chairman, South Midland Committee) presided over a gathering of about 160.

ALD. E. HUNTSMAN (president E.D.A.) said that the occasion was the first on which the Council of E.D.A. had visited one of the local areas. E.D.A. was the advance guard of the forces of electricity. Nevertheless, out of 52 undertakings in the area only 41 were members of the Association, and of these no more than 24 subscribed on the full scale; the income from the area was only 57 per cent. of what it should be. The total income of E.D.A. was £40,000 per annum, compared with probably at least £100,000 devoted to propaganda by the gas industry. He proposed the toast of "E.D.A.," coupled with the name of Mr. Cramb.

MR. A. C. CRAMB, responding, referred to the need for funds before progress could be made. The supply of electricity was the only business which had not needed to sell its product, which, indeed, till now had sold itself. Even where selling staffs were adequate in numbers they were often untrained, though education was being imparted by the conferences and lectures of E.D.A. Selling was just as important as generation and distribution, which had occupied only about 25 per cent. of his own time.

LT.-COL. W. A. VIGNOLES urged that all electrical exhibitors should make a strong effort to secure space in the electrical section of the next British Industries Fair. He said that during his term as director of E.D.A., area committees had been developed and strengthened by the engagement of full-time secretaries, and this policy had proved to be sound. Last year had seen an increase in subscriptions of some £6,000, which was enough to pay for the local organisations. He claimed for E.D.A. that it had been responsible for the Press publicity given to electricity, except that recently provided by the gas companies in their attacks on the Minister of Transport.

MR. G. H. LAKE (chairman, Area Committee) proposed the health of Mr. Chattock, the first area chairman. After MR. R. A. CHATTOCK had responded with the telling of a few anecdotes, MR. W. T. PHILLIPS proposed the health of the chairman, who briefly replied.

Modern Grinding.

As grinding and pulverising account for the major part of the total cost of the final product in so many industries to-day, the object of the paper read by Mr. J. C. Farrant before the Society of Chemical Industry (chemical engineering group) was to present actual operating data relative to numerous different materials in an endeavour to indicate the respective fields in which various classes of mills can be most efficiently applied. The selection of the right type of grinding machinery is, however, often attended with considerable difficulty in view of the scores of different makes on the market, many of the types available being descriptively illustrated in the paper. Moreover, it is probably more difficult to indicate the best type of mill for any given set of coal-pulverisation conditions than in any other field, as, whilst there are considerable variations in the grindability of different coals, coal considered from a grinding standpoint is not really a hard substance. Consequently local conditions play a larger part in the selection of the equipment than in ordinary industrial problems. In addition, the fact that this is a comparatively new industry leads to changes of fashions and opinions.

The central system is most suitable for use with constant-output mills, as the latter can be run at maximum duty for a certain number of hours per day, leaving the remainder of the time for renewals and repairs. In this way little or no stand-by milling equipment is required.

The unit system offers simpler plant, as the mill is connected through a fan direct to the burner. In plant designed to run for 24 hours per day, however, it is imperative to install stand-by machines, so that they may be brought into use when it is desired to overhaul or renew any part of the other mills. Another factor in its favour is, of course, that it is cheaper in first cost, although maintenance figures (especially when the loads vary) are usually higher than in the central system.

Mills of the low- and medium-speed types are definitely indicated for the central system. For the unit system all three groups are used, but mills of the high-speed variety are popular on account of the small floor space they occupy and their simplicity. Until comparatively recently unit installations were not of a large denomination in total output, but there is no doubt that the tendency at the present time is toward unit milling, as distinct from central milling, even for large plant.

The International Aluminium Competition.

Some time ago we announced the promotion of an International Aluminium Competition with prizes totalling £800 and having as its object the stimulating of research into new uses and applications of aluminium in the arts and industries. We are reminded that the final date for the sending in of particulars of inventions, &c., by competitors is April 1st. Particulars should be sent before this date to the Bureau International de l'Aluminium, 23, bis Rue de Balzac, Paris.

Electricity Commissioners' Annual Report.

The tenth annual report of the Electricity Commissioners, covering the year ended March 31st, 1930, has been issued this week (H.M. Stationery Office, price 3s.). The electrical energy sold by authorised undertakers during the year represented an increase of 993 million kWh, or about 13 per cent., above the figure for the previous year (7,603,290,446 kWh). The total kWh generated amounted to 10,526 million, or an increase of over 1,053 million above the figure for the year ended March 31st, 1929. As an indication of the progress that is being made in the extension of electricity supply into rural areas, over 203,000 consumers had been obtained in this way up to the end of the year under review by 223 undertakers, and it is particularly interesting to note that over 90 per cent. of these consumers are of the domestic class. In all, about 57,000 new consumers were connected during the year, or an increase of about 39 per cent. above the figure for the preceding year. Of the total increase of consumers about 39 per cent. is made up of domestic and farming consumers. The report emphasises the importance of developing domestic supply, both because of the great potentialities of the domestic load and of its value as a stabilising factor in the development of electricity supply generally.

London Electricity Supply.

As we go to Press we receive a copy of the report of the London and Home Counties Joint Electricity Authority for the year ended March 31st, 1930 (December 31st, 1929, in the case of company undertakers). The energy generated and sold by authorised undertakers in the district amounted in each case to about one-fifth of the total figure for the authorised undertakers in Great Britain. Over 2,516 million kWh was generated during the period under review, or 15.7 per cent. more than the corresponding figure for the previous year. The sales for the year amounted to 2,024 million kWh (excluding bulk supplies) or an increase of over 15 per cent. The average price received for all classes of supplies during the year was 1.89d. per kWh sold, as compared with 2.67d. per kWh sold in 1918-19.

Safety in Mines.

An important conference on "Safety in Mines" was held on February 14th at Glasgow. Mr. E. Shinwell, M.P., Secretary for Mines, presided, and the conference was attended by representatives of the colliery owners, officials, and workmen from all the mining districts in Scotland. The principal speakers' subjects were as follows:—Sir Henry Walker, H.M. Chief Inspector of Mines for Great Britain, "Ways and Means for Increasing Safety in Mines"; Mr. J. Masterton, H.M. Divisional Inspector of Mines for Scotland, "Haulage and Other Accidents in Recent Years"; Prof. R. V. Wheeler, director of the Safety in Mines Research Board's stations and laboratories, "Explosions"; and Major H. M. Hudspeth, chief mining engineer of the Safety in Mines Research Board, "Falls of Ground."

An informative lecture on coal cutting and conveying machinery was delivered recently by Mr. J. Anderson (of Messrs. Mavor & Coulson, Ltd.), to a large gathering of mining students and others at Glasgow. Mr. Wm. Mackie, J.P., a member of the Education Committee, introduced the lecturer, who dealt with the recent changes in coal cutters, and said the bar machine was about holding its own, while the chain machine was forging ahead. A new type of scraper conveyor was at present being tried in this country and one of the collieries in the district was lending a hand in the experiment.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. A. C. Cramb, the new director and secretary of the British Electrical Development Association, was the guest of honour at a reunion dinner held at the Holborn Restaurant last week by former members of the staff of the Croydon Corporation Electricity Department, of which Mr. Cramb has been engineer and manager since 1903. The chair was occupied by Mr. J. H. Parker, chief electrical engineer of the L.C.C. Tramways, and he was supported by Mr. A. P. McAlister (Islington), Mr. W. C. Bexon (Kilmarnock), and Mr. E. Lewis (Ramsgate). Apologies for their absence were received from Messrs. W. Burr (Swansea), C. Salt (Carlisle), and H. Wilson (Ashford). The opportunity was taken to present Mr. Cramb with an inscribed silver rose bowl, and in making the presentation Mr. McAlister made special reference to the enthusiasm and success with which Mr. Cramb had carried on the commercial development of the Croydon undertaking.

We reproduce herewith a photograph of **Mr. F. N. Rendell-Baker,** whose appointment to the position of chief engineer and manager of the Croydon Corporation Electricity Department is announced. After serving his apprenticeship with the Bolton Electricity Department, Mr. Rendell-Baker successively held positions as charge engineer at Darwen and Farnworth. In 1913 he was appointed senior charge engineer at St. Helens, where he was promoted to power station superintendent, and later, in 1921, to chief electrical engineer and manager. Three years ago he took up his present appointment as borough electrical engineer and manager of the Halifax Electricity Department. He is an associate member of the I.E.E., and for some years has taken an active part in the work of the British Electrical Development Association. He now holds the position of chairman of the North Midlands Area Committee of this latter organisation and is also a member of the executive council. A local publicity circle under the title of the Halifax Electrical Development Association has also been formed during his term of office at Halifax.

Lafayette [*London.*

Mr. F. N. Rendell-Baker.

The new chief electrical engineer and manager, Croydon.

Mr. E. R. T. Pink, who for the last fifteen years has been associated with Messrs. Berry's Electric, Ltd., has now joined the staff of Messrs. Young & Wildsmith, Ltd., electrical and radio distributors. He will represent them in London and on the South Coast.

The Hon. John R. Cooke, vice-chairman of the Hydro-Electric Power Commission of Ontario, has been appointed acting chairman in the place of Mr. C. A. Magrath, who recently resigned from the Commission.

Mrs. D. Sandy has been appointed lady demonstrator in the Epsom Urban District Council Electricity Department.

The Jackson Electric Stove Co., Ltd., has appointed new sales assistants as follows:—**Mr. W. R. Radcliffe** to the Leeds branch, 14, Britannia House, Wellington Street; Mr. **F. K. Fell** to the branch at 42, Needless Alley, New Street, Birmingham; and **Mr. L. M. Vassall** to the head office, 143, Sloane Street, London, S.W.1.

Mr. Henry Victor Verrells (he will be known as Mr. H. Vic-Verrells), brother of Mr. W. S. Verrells, the managing director of Messrs. E. K. Cole, Ltd., of Southend-on-Sea, has been appointed export manager to the company in connection with a big overseas push.

Mr. L. E. Mather, chairman of Mather & Platt, Ltd., announced at the company's annual meeting on February 19th that he was sailing for South America on the following day to attend the opening of the Buenos Aires Exhibition. He said that he intended to visit Brazil and possibly other South American countries.

Mr. Cedric E. Fry, A.M.I.E.E., Skegness, and Miss Helen Nelson, of Kentrigg, Kendal, were married at Burneside, Kendal, on February 14th.

It is reported in the local Press that **Mr. S. Derwen Jones,** borough electrical engineer of Batley, contemplates retirement next August, after 29 years' service with the Corporation.

Obituary.

Mr. F. H. Robinson.—The death has occurred of Mr. Frederick Haswell Robinson, mains superintendent to the Epsom Council's electricity department, where he had been engaged from the inception of the undertaking 30 years ago. He had been mains superintendent since 1926 and was 53 years of age. A large number of councillors, council officials, and representatives of electrical manufacturers and other electricity supply undertakings were present at the funeral.

Mr. S. Stacey.—The funeral took place at South Gosforth Cemetery on February 17th of Mr. Samuel Stacey, who was for over 25 years connected with the Newcastle-upon-Tyne Electric Supply Co., Ltd. Many of his colleagues from the company were present, among them being Messrs. Couves, Monkhouse, C. Skipsey, H. Sherlock, Harrison, E. S. Pattinson, Nicholson, and A. H. Marshall.

Mr. R. A. McLaren.—Mr. Richard A. McLaren, for 25 years general manager of the works of Messrs. Babcock & Wilcox, Ltd., Renfrew, has died at his residence in Kilmacolm. Mr. McLaren retired from the company's service in 1925.

Mr. Frank Ollett.—The funeral took place on February 19th of Mr. Frank Ollett, for many years superintendent at Blackburn Corporation electricity works.

Will.—The late **Mr. H. J. Dowsing,** chairman of the Dowsing Radiant Heat Co., Ltd., and a director of the Egham and Staines Electricity Co., Ltd., left estate of the gross value of £15,222 (£8,676 net personalty).

Financial Section.

New Companies Returns of Share Capital, Debenture Charges, Reports of Electrical Companies Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Western New South Wales Electric Power Proprietary, Ltd.—Particulars filed February 13th pursuant to Section 344 of the Companies Act, 1929. The company was incorporated in Victoria. The British address is at 95, Gresham Street, E.C.2, where W. H. Bryant is authorised to accept service of process and notices on behalf of the company. The directors are:—The Hon. W. L. Baillieu, Sir Frank B. Moulden, L. K. S. McKinnon, C. Fraser, and M. L. Baillieu, all of Melbourne; and A. G. Campbell, of Sandringham, Victoria. Advisory committee in London: Sir Robert S. Horne, K.C., M.P., 72, Devonshire House, W.11; C. L. Baillieu, "Parkwood," Englefield Green, Surrey; and G. W. W. McKinnon, 24, Evelyn Gardens, S.W.7.

Richardson & Whitaker, Ltd.—Private company. Registered February 16th. Capital, £5,000 in 1,150 preference and 3,850 ordinary shares of £1. Objects:—To acquire the business of wireless service agents now carried on by M. C. Richardson and J. E. J. Whitaker. The directors are:—M. C. Richardson (chairman), "Elmcroft," Rushmore Hill, Knockholt, Kent; J. E. J. Whitaker, 9, Wycliffe Gardens, Wembley, Middlesex; I. W. E. Hustler, "Sarrawanga," Woldingham, Surrey; F. T. Parkhurst, "Halcroft," Cassiobury Drive, Watford. Registered office: Lamb Alley, Bermondsey, S.E.1.

Automatic Rectifying Plants, Ltd.—Private company. Registered February 16th. Capital, £1,500 in £1 shares. Objects:—To carry on the business of wireless and electrical accessory dealers, electrical engineers and merchants, accumulator and battery chargers and agents, &c., and to adopt agreements (1) with F. T. Smith and (2) with A. Barnett and A. Hartfield. The first directors are:—A. Barnett, 65, Court Way, Colindale, Middlesex, electrician; A. Hartfield, 88, Croft Park Road, Croft Park, S.E.4; F. T. Smith, 11 Atkins Road, S.W.12 (chairman). Registered office: 4a, Halvergate Parade, Burnt Oak.

Crosland & Bateson, Ltd.—Private company. Registered February 21st. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, wireless, telephone, lighting, heating, motor and general engineers, &c. The directors are: G. F. B. Crosland and Annetta Crosland, 83, Bradford Road, Batley. Solicitors: J. H. Wilman, Bank Chambers, Batley.

R. G. Dixon & Co., Ltd.—Private company. Registered February 23rd. Capital, £6,000 in £1 shares. Objects: To acquire the business of dealers in vacuum cleaners and electrical appliances now carried on at 116, Victoria Street, Westminster, S.W., as "R. G. Dixon & Co.," and "The Vampire Vacuum Cleaner Co." The directors are: R. G. Dixon, 98, King's Avenue, Clapham, S.W.; E. H. Chambers, East Hall, Boughton, Monchelsea, Kent (director Wembley Scientific Laboratories, Ltd.). Registered office: 116, Victoria Street, Westminster, S.W.1.

E. T. Turner, Ltd.—Private company. Registered February 23rd. Capital, £2,500 in £1 shares (2,200 ordinary and 300 founders). Objects: To acquire the business of an electrician and dealer in radio supplies now carried on by E. T. Turner at 77a, High Street, and 16, Waterloo Road, Epsom, Surrey, as "E. T. Turner." The directors are: G. W. Blackwell, senr., address not stated; G. W. Blackwell, junr., The Poplars, Beaconsfield Road, Epsom Downs; A. E. Blackwell, address not stated; E. T. Turner, 16, Waterloo Road, Epsom.

Telephone and Associated Services, Ltd.—Private company. Registered February 14th. Capital, £10,000 in £1 shares. Objects: To acquire so much of the undertaking of Telephone and General Trust, Ltd., as consists of the businesses of secretaries, managers, &c.; to carry on business as financial and commercial agents, importers, exporters, shipowners, electricians, telegraph and telephone engineers, manufacturers of and dealers in electric cables and telegraph, telephone and wireless instruments, &c. The subscribers (each with one share) are:—S. G. Brook and E. Rudland, 2, Bond Court, Walbrook, E.C.4, clerks. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.4.

Public Utilities (Electric), Ltd.—Private company. Registered February 19th. Capital, £25,000 in £1 shares. Objects: To carry on business as consulting and electrical engineers, electricians, financial advisers, manufacturers and contractors; to construct or take part in the construction, management, or control of electric light or power or public utility undertakings, &c. The subscribers are:—R. Witt, solicitor, and A. H. Throssell, managing clerk. Solicitors: Stephenson, Harwood and Tatham, 16, Old Broad Street, E.C.2.

Wallage & Sons, Ltd.—Private company. Registered February 18th. Capital, £500 in 250 7 per cent. cumulative preference shares of £1 and 1,000 ordinary shares of 5s. each. Objects:—To acquire the business of an electrical and wireless engineer carried on by M. J. Wallage, at 15, Baker Street, Brighton, as "Wallage & Sons." The first directors are: M. J. Wallage, 68, Rugby Road, Brighton, electrical and wireless engineer (permanent); Miss M. N. Brennand, 136, Hollingbury Road, Brighton; W. Adams, 55, Grantham Road, Brighton, accountant. Solicitors: J. K. Nye & Donne, Brighton.

F. J. Ashton, Ltd.—Private company. Registered February 18th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and distributors of and dealers in wireless, radio-gramophone, telegraphic, telephonic apparatus, valves, instruments, equipment, accessories, electrical, magnetic and radioactive instruments, and switchboards, &c. The subscribers are: J. J. Heller, 173, Highbury New Park, N.5, merchant; F. J. Ashton, 90, Woodfield Park Drive, Leigh-on-Sea, manufacturers' agent. Secretary: F. J. Ashton.

O. K. Relays, Ltd.—Private company. Registered February 20th. Capital, £3,000 in £1 shares. Objects: To carry on the business of distributors and relayers of wireless, television, radio and other signals and programmes, radio engineers and manufacturers, &c. The subscribers are: E. C. Porter, 48, Cranbrook Road, Ilford, electrical engineer; J. W. Cushway, "Shen Tor," Mount Crescent, Brentwood, market clerk. Solicitor: O. A. Cayley, 30, Bedford Row, W.C.1.

Official Returns of Electrical Companies.

Burndept Wireless (1928), Ltd.—E. Maloney, O.B.E., 11, Ironmonger Lane, E.C.2, was appointed receiver and manager on February 11th, 1931, under powers contained in debenture dated October 28th, 1929.

E. P. Cottier, Ltd.—Capital, £1,000 in £1 shares. Return dated December 24th, 1930. 650 shares taken up. £650 paid. Mortgages and charges, nil.

M. Coquantin & Co., Ltd.—Capital, £12,000 in £1 shares. Return dated November 26th, 1930. 8,800 shares taken up. £8,800 paid. Mortgages and charges, nil.

F. J. Jones & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 13th, 1930. 3,700 shares taken up. £2,050 paid. £1,650 considered as paid. Mortgages and charges, nil.

British Secheron Co., Ltd.—Capital, £4,000 in £1 shares Return dated January 1st, 1931. All shares taken up. £4,000 paid. Mortgages and charges, nil.

Carrington & Button, Ltd.—Capital, £6,000 in £1 shares. Return dated December 15th, 1930. 4,887 shares taken up. £1,803 paid. £3,084 considered as paid. Mortgages and charges, £500.

Light o'Day Electric Lamp Co. (1927), Ltd.—Capital, £10,000 in 7,000 preference shares of £1 and 60,000 ordinary shares of 1s. each. Return dated December 31st, 1930. 6,190 preference and 60,000 ordinary shares taken up. £6,190 paid on 6,190 preference. £3,000 considered as paid on the ordinary shares. Mortgages and charges, nil.

Inventum Electrical Appliances, Ltd.—Capital, £500 in £1 shares. Return dated November 10th, 1930. 52 shares taken up. £52 paid. Mortgages and charges, nil.

L. Nicholson & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated November 7th, 1930. 4,002 shares taken up. £952 paid. £3,050 considered as paid. Mortgages and charges, nil.

Siemens Bros. & Co., Ltd.—Satisfaction to the extent of £36,400 on January 1st, 1931, of debenture stock authorised January 15th, 1918, and secured by trust deed of same date, and registered January 21st, 1918. (According to the register of mortgages, the trust deed registered January 15th, 1918, originally secured £1,330,000 debenture stock.)

North Wales Power Co., Ltd.—Satisfaction to the extent of £6,000 on November 14th, 1930, of mortgage dated May 6th, 1921 (acquired by the company on June 29th, 1929), and registered April 29th, 1930. (According to the register of mortgages, the mortgage registered April 29th, 1930, originally secured £6,000).

West Sussex Electrical Co., Ltd.—P. W. Moll, 23, Coleman Street, E.C., was appointed receiver on February 4th, 1931, under powers contained in debentures dated February 25th, 1928.

Arctic Electric Supplies, Ltd.—R. T. Cuff, 17, Bedford Row, W.C.1, was appointed receiver and manager on February 4th, 1931, under powers contained in debenture dated November 28th, 1930.

Electric Lamp Distributors, Ltd.—J. Stone, "Legality," Canvey Island, Essex, was appointed receiver on February 3rd, 1931, under powers contained in debenture registered March 29th, 1930.

Sydney W. Bussell, Ltd.—A. E. Tilley, 8, Staple Inn, W.C.1, ceased to act as receiver and manager on February 11th, 1931.

Johnson & Bolsom, Ltd.—Issue on February 6th, 1931, of £830 debentures, part of a series already registered.

City Notes.

Burndept Wireless (1928), Ltd.

The adjourned annual meeting is to be held to-day (Friday). With the notice calling the meeting was enclosed a report by the shareholders' committee which states that the conclusion has been arrived at that there is no possibility of continuing the business without the provision of substantial capital. While paying a tribute to the loyalty and keenness of the staff, the committee attributes the company's present position to the lack of an experienced controlling head who could have originated and co-ordinated the work done by the various departments. It goes on to say: "In spite of the strenuous efforts which it is apparent have been made by the board and the staff to retrieve the position during the last twelve months (the last three being the peak of the radio season), the trading results for the last six months are even more unfavourable. Your committee are of the opinion that properly constituted and managed, and with sufficient further capital, your company is capable of turning out the highest grade radio apparatus and that in spite of past history it still commands the support of the trade and the public."

As a result of the joint deliberations of the board and the shareholders' committee it was considered necessary in the interests of all concerned that the company's bankers should appoint a receiver and manager of the business. Messrs. Coutts & Co. accordingly appointed Mr. E. Maloney, F.C.A., of Messrs. Peat, Marwick, Mitchell & Co., as receiver and manager on February 11th, and he is carrying on the business.

London Tramway Companies.

Metropolitan Electric Tramways, Ltd.—The net income for the year ended December 31st last was £184,637, as compared with £154,790 in the previous year. After deducting interest, rentals, &c., there is a balance of £35,796, which is applied to reducing the deficit brought forward from previous years. The deficiency carried forward is £38,097.

South Metropolitan Electric Tramways and Lighting Co.—The profits for 1930 were £74,010. Interest, &c., absorbs £14,472, renewals receive £30,000 but no transfer is made to reserve (against £10,000). The ordinary dividend is again 5 per cent., while the balance carried forward is £14,328.

London United Tramways, Ltd.—The net income for the year ended December 31st last was £58,427 (against £73,573 for 1929). After charging interest, rentals, &c., there is a balance of £4,092 which is applied to reducing the debit balance to £31,955.

London and Suburban Traction Co., Ltd.—The revenue for the past year totalled £57,695, to which is added £46,617 brought forward. Expenses, &c., require £12,338, and debenture interest, &c., £34,468. The balance of £57,506 is carried forward, no dividend being proposed on the preference shares.

Metropolitan Railway Co.

The annual meeting was held on February 19th, Lord Aberconway (chairman) presiding. In presenting the report and accounts (ELEC. REV., February 20th, p. 432), the chairman said that the increase in the receipts from season tickets was likely to continue owing to the various building estates under development between Wembley Park and Uxbridge and Rickmansworth and Watford. Receipts from ordinary passenger traffic had declined and they were being hit severely not only by the omnibus competition for short distances, but also by motor-coach competition for longer distances. The reconstruction of Great Portland Street station was finished and the rebuilding of Euston Square station was in progress. They had commenced the construction of the new line between Wembley and Stanmore and this would be ready for traffic within 21 months from the date of commencement (December 20th last). Six new high-pressure boilers had been installed and were in commission at Neasden power station. The report and accounts were adopted.

Midland Counties Electric Supply Co., Ltd.

The report for 1930 shows trading profits for the undertakings owned and operated of £376,963, as against £349,209 in 1929, from which £108,700 was appropriated for depreciation and reserves in these undertakings. The balance at credit of profit and loss account of the holding company, including £4,578 brought in, was £265,854. Loan and debenture interest, &c., absorb £28,080, and £26,363 is placed to reserve. A final dividend of 4½ per cent. is proposed on the ordinary shares, making 7 per cent. for the year, less tax, and in addition interest at 6 per cent. per annum on instalments in respect of the issue of 450,000 ordinary shares requires £1,743. The sum carried forward is £5,067. The electricity supply undertakings continued to show expansion, although trade depression retarded the rate of progress in the growth of the industrial load. Supplies have been afforded in many new districts and an additional Special Order has been obtained. In two of the traction undertakings the system has been changed over to omnibus traction. During the year 50,000 preference shares and 450,000 ordinary shares were issued. Meeting: March 2nd.

Mather & Platt, Ltd.

Presiding at the annual meeting on February 20th, Mr. L. E. Mather (chairman) in the course of his speech said that all sections of their business had suffered as a result of the world-wide depression in trade. Their home business in the aggregate had been reasonably good, but trade conditions overseas had led to a heavy fall in the order book. In Europe the shortage of orders was relieved by an improvement in respect of Holland, while their French company's business, though restricted, had shown a satisfactory return. Indian returns were affected by political unrest, and were considerably reduced, and while the Japanese figures continued to be disappointingly low, there was an increased amount of business from China. There was an increase, in spite of tariff walls and depression, of textile machinery orders from the United States. During the year they had started a new activity—namely, that of manufacturing process machinery for the canning industry, for which they had already obtained substantial orders. The report and accounts were adopted.

Electrical Distribution of Yorkshire, Ltd.

The accounts for 1930 show a profit of £106,319, as compared with £96,482 in 1929. To this is added a balance brought in of £23,657, making £129,976 available. The directors recommend a dividend at the rate of 9 per cent. per annum on the ordinary capital, and that £10,000 be placed to reserve, increasing this fund to £105,000, leaving £22,326 to be carried forward. The number of new consumers connected during the year was 6,683, making a total of 41,827, and the report states that there has been a substantial increase in the sale of electricity for domestic and other purposes. It is proposed to make an issue of 100,000 shares after the meeting of shareholders on March 3rd next. The price of issue will be 26s.

Crossley Bros., Ltd.

The net profit for the year 1930 amounted to £30,205, which added to £157,403 brought in, makes £187,608, out of which a dividend has been paid on the 7 per cent. cumulative preference shares for the first half of the year. According to the *Financial News*, the directors state that owing to the difficulty of obtaining money from nearly all countries in the world at the current rates of exchange, they regret they cannot recommend the payment on March 1st of the dividend on the preference shares for the second half of the year. This dividend will be paid at a later date if circumstances permit. The reserve fund receives £70,000, against nil, and the balance of £103,489 is carried forward.

Australian Companies' Dividends.

The Melbourne Electric Supply Co., Ltd., has announced that its amended articles of association require the payment of dividends by means of warrants payable at the Bank of Australasia. Therefore if these are cashed at the London office of the Bank they will be subject to deduction of Australian exchange as well as British income tax on the net amount payable. An announcement of a similar nature has been made by the Adelaide Electric Supply Co., Ltd. In this company's case, however, the dividend on the 5 per cent. "A" preference stock, which is paid free of British income tax, will be subject to the deduction of exchange only.

Northampton Electric Light & Power Co., Ltd.

The revenue for 1930 was £239,764, and expenses totalled £149,838, leaving a balance of £89,926. After deducting debenture interest, &c., there is a balance available of £44,171. It is proposed to pay a final dividend of 6 per cent. on the ordinary shares, making 10 per cent. for the year, and to carry forward £10,009. The policy of extending the supply into rural districts has been continued, and during the year £92,489 was spent on mains. The sales of electricity increased from 32,949,081 to 38,310,015 kWh.

Rushden & District Electric Supply Co., Ltd.

The accounts for the year ended December 31st last show a total revenue of £33,653 and expenses of £24,928, leaving a balance of £8,725. After deducting debenture interest, &c., it is proposed to pay a final dividend of 4½ per cent., making 8 per cent. for the year, and to carry forward £1,494. In November the remaining 15,000 shares were issued to the shareholders at 25s. per share, and during the year £16,700 5 per cent. debenture stock was also issued, bringing the total to the maximum amount at present authorised, £50,000. Electricity sold totalled 3,639,105 kWh, an increase of 19 per cent. as compared with 1929.

Lancashire United Transport & Power Co.

The receipts of the operating companies for 1930 totalled £334,806, and expenditure was £316,446, leaving a gross profit of £96,447. The net revenue of the parent company was £90,004, and after deducting interest charges, &c., £28,721 is carried to depreciation account. According to the *Financial Times*, the report states it is again necessary to make a large allocation to depreciation account owing to the gradual abandonment of the tramways and the heavy expenditure being incurred. Depreciation and renewal accounts and amounts carried forward in the combined companies now total £230,619.

Tyneside Tramways & Tramroads Co.

The report for the year ended December 31st last shows a surplus of receipts over expenses of £7,728, to which is added £85 brought in, making £7,813. After deducting interest on mortgages, hire and depreciation of 'buses, &c., there is a balance to be carried forward of £162. The tramways were abandoned and omnibus services inaugurated on April 7th last. The company has disposed of a large portion of its realisable tramway assets.

Companies Struck Off the Register.

The following companies have been struck off the Register, and they are thereby dissolved :—

Alpha Electric and Oxy-Acetylene Welding Co., Ltd.
Bower Electric, Ltd.
Eagle Electrical Manufacturing Co., Ltd.
Sheffield Wireless Depôt, Ltd.

Chiswick Electric Supply Corporation, Ltd.

The report for 1930 states that the net expenditure on machinery, &c., was £5,942 (£3,931 at Chiswick and £2,011 at Aberystwyth). The profit was £25,445, and after deducting the interim dividend, and adding the amount brought forward, £20,273 is available. The directors recommend a final dividend of 6 per cent. actual (less tax), and £3,731 is carried forward.

Midland Electric Manufacturing Co., Ltd.

The net profit for 1930 was £44,140, as compared with £45,192 in the preceding year, to which is added profit on investments (£4,319) and £14,640 brought in, making £63,099 available. Reserve receives £10,000, and it is proposed to again pay an ordinary dividend of 10 per cent., plus a bonus of 12½ per cent. The carry forward is £19,123.

Smithfield Markets Electric Supply Co., Ltd.

The report for 1930 records a net profit, after providing for debenture interest, &c., of £8,186, which with £2,781 brought forward, makes £10,967 available. A final dividend of 5 per cent. is recommended, making 8 per cent. for the year, general reserve receives £3,000, contingency fund £500, and £2,667 is carried forward.

Charles Clifford & Son, Ltd.

The net profit for 1930 was £11,743, which with the balance brought in makes £50,989. It is proposed to transfer £5,000 to reserve and to pay a final dividend at the rate of 10 per cent. per annum on the ordinary shares, together with a bonus of 5 per cent., both tax free, leaving £35,139 to be carried forward.

Clarke, Chapman & Co., Ltd.

The net profit for 1930 was £83,838, as against £93,907 in the preceding year, and after deducting depreciation, &c., it is proposed to pay a final dividend of 7 per cent. on the ordinary shares, making 10 per cent. for the year (against 11 per cent.). Reserve receives £16,000 and £24,065 is carried forward.

Buenos Ayres Lacroze Tramways Co.

The working profits for the year ended June 30th last were $1,912,662, a decrease of $880,675 as compared with the previous year. No dividend is recommended (against 4 per cent.), $485,000 being placed to renewals and $66,241 to extraordinary reserve.

Mersey Railway Co.

The report for 1930 shows a net revenue of £90,969, to which is added £3,683 brought forward, making £94,652. After deducting debenture interest, &c., it is proposed to pay a dividend at the rate of 1 per cent. on the consolidated ordinary stock, leaving £4,000 to be carried forward.

Norwich Electric Tramways Co.

An interim dividend has been declared of 2½ per cent., less tax (same).

Quebec Power Co.

The gross earnings for 1930 were $3,677,102 (against $3,543,795). Operating expenses were $1,296,103, and interest $600,000. Dividends took $1,382,995, and the surplus is $248,004, bringing the profit and loss balance to $539,420.

Telephone & General Trust, Ltd.

The net revenue for 1930 was £77,115 (against £35,910 in 1929). A dividend of 8 per cent. is proposed on the ordinary shares (6 per cent. in 1929), and £26,637 is carried forward.

South London Electric Supply Corporation, Ltd.

A final dividend of 5½ per cent. has been declared on the ordinary shares, making the standard dividend of 8½ per cent. for the year.

Consolidated Gas, Electric Light & Power of Baltimore.

A dividend is announced of 90 cents per share on the common shares for the quarter ending March 31st.

County of London Electric Supply Co., Ltd.

A final dividend is announced of 8 per cent. on the 3,374,889 old ordinary shares, making 11 per cent. for 1930 (same).

National Gas Engine Co., Ltd.

The directors are unable to recommend a dividend on the ordinary shares for 1930, against 7½ per cent., less tax, in 1929.

Clyde Valley Electrical Power Co.

The directors recommend a final dividend of 5 per cent. on the ordinary shares, making 8 per cent. for the year (same).

Metropolitan Electric Supply Co., Ltd.

The directors recommend a final dividend at the rate of 14 per cent. per annum on the ordinary shares, making 10 per cent. for the year.

Newcastle-upon-Tyne Electric Supply Co., Ltd.

A final dividend has been declared on the ordinary shares of 3½ per cent., making 6 per cent. for the year (same).

South Metropolitan Electric Light & Power Co., Ltd.

A final dividend is announced on the ordinary shares of 6 per cent., making 9 per cent. for the year (same).

Stocks and Shares.

TUESDAY EVENING.

THE clouds of industrial depression are said to be lifting in the United States, and from various other quarters of the globe there come hints that the world has started upon a recovery from its long malaise. The effect is already seen in a fairly material recovery amongst American utility and similar stocks and shares. In another direction, the tin industry has received Government approval of a restriction scheme that is to come into force next Monday, and which it is hoped may lead to such success as will encourage similar movements on the part of other branches of trade. Against these mildly favourable factors must be set the approach of a threatening Budget, the fact that the majority of company reports this year will make anything but cheerful reading, and the possibility of money becoming a little dearer. The last-named factor is responsible for fresh falls in such gilt-edged stocks as those of the London Power Company and London & Home Counties.

Home Electricity Issues.

Apart from the dulness shown by the gilt-edged stocks just mentioned, the market in Home Electricity shares is, generally speaking, firm. Kensingtons are better at 29s. Chelseas have risen to 28s., and Brompton ordinary to the same price. On the other hand, Electric Supply Corporations have given way to 47s. 6d., and County of London ordinary at 46s. 3d. are half-a-crown down. Midland Counties fell back 1s. to 27s. 6d., this in spite of the fact that the report for 1930 shows a balance to the credit of profit and loss account of £265,800, an increase of £23,000 on the year. The Electrical Distribution of Yorkshire Co. announces that it is about to make an issue of 100,000 shares at 26s., which will be offered next week to the shareholders. The present price of shares is 33s. 3d., so that the new issue will represent a useful bonus. The company declares a dividend making 9 per cent. for the year, the same as that of twelve months ago, when the capital was smaller. The meeting will be held in Leeds next Tuesday. The Lancashire United Transport & Power Co. shows an increase of rather over 7 per cent. in its traffic receipts for 1930, as compared with those for the previous twelve months. The directors propose to raise more money this year in order to complete the change-over from tramway to trolley 'bus traction. The London companies continue to announce the same rates of dividend as those paid for 1929, though in some cases the profits are less.

Australian Companies.

Financial affairs in Australia show faint signs of mending. The weakness of Australian Government and municipal stocks is still, however, an unhappy feature of the Stock Exchange markets, and the rate of exchange lies heavily against the Commonwealth. Melbourne Electric Supply consolidated stock, the last business in which was marked at 176 on March 10th, 1930, is now quoted at 115 middle, while the company's £5 first preference shares, carrying 8 per cent. dividends, stand at 80s., at which price business was recorded about a week ago. Adelaide Electric 6 per cent. preference stock is quoted nominally at 75 middle, and the 5 per cent. "A" preference, free of income tax, at the same figure. The last marked bargains in these stocks were at 96 on New Year's Eve, 1930, for the 6 per cent. preference, and 99½ for the "A" preference on October 10th, 1930. In the Indian group, Calcutta Electric ordinary strengthened to 39s. 6d., and the new shares to 5s. 9d. premium. Burma Electric Supply ordinary have dropped to 8s. 9d.

Electric Railway Stocks.

A fall of 4½ points in Metropolitan consolidated stock has lowered the price to 52½. Districts have shed an equal amount, dropping to 72½. These movements follow directly upon the speech of the chairman of the Metropolitan Railway Company, when he, Lord Aberconway, indicated the likely results to stockholders which may ensue from the Government's proposal to co-ordinate the whole of London's passenger transport into one combine. The chairman maintained that the shareholders of the various enterprises concerned were henceforth to be deprived of all office and control, while the management would pass into the hands of a Government-appointed Board of Control. The statement has had the effect of unsettling the market for the gilt-edged stocks of the Underground group. Central London 5 per cent. debenture, and London Electric 5 per cent. debenture, which until lately were standing at 104, have given way to 102½, though the prior-charge stocks of the Metropolitan and of the District Companies have been left unchanged.

Cables and Wireless.

Cables and Wireless stocks are better, the preference at 72 being 1¼ up. The prices had hardened still further, but gave way on publication of the January traffics, which at £413,000 were regarded as disappointing. Globe Telegraph and Trust preference strengthened to 10½. Prices of the American issues are decidedly firmer, International Telephone and Telegraph gaining 5 points at 37½. American Telephone and Telegraph rose 4 to 204. Great Northern Telegraph, after a long period of heaviness, have improved to 29½, which is 10s. up. Marconi Marines strengthened to 37s. 6d., but business in Canadian Marconis lapsed into its ordinary condition of quietude, after the shares had enjoyed a spasm of activity and strength. The price is about 15s. 9d. International Automatic Telephones eased off to 35s.

Manufacturing and Equipment.

Why the price of Callenders should have fallen to 3, and that of British Insulated ordinary to 3¼, showing declines of ¼ and 3/16, respectively, it is difficult to ascertain. The Stock Exchange market explains the drop by reference to sales on behalf of the deceased accounts. In some directions the more probable reason is advanced of the prices looking high on the yields which the shares afford as compared with the gilt-edged investments that have given way so considerably during the past week or so. The fact remains that the market for the best-class electrical manufacturing shares is heavy. Henleys have gone back 3/16 to 5 11/16, Enfields 1/16 to 4¼. G.E.C. ordinary at 2¼ are 1/16 down. Associated Electrical Industries ordinary shares at a guinea show a fall of a shilling. Other shares in the group are similarly dull. India-Rubber, Gutta-Percha shares came on offer at 5s. 6d. Philips Incandescent Lamp Works ordinary are tolerably steady at 38s. 9d. Hall Telephone Accessories at 17s. show a decline of a few pence. British Power and Light shares at 10s. are ninepence down.

Tramway and Traction.

British Electric Traction deferred ordinary stock has followed up its last week's fall of 75 points by losing a similar amount, the price now being 1,225. This is slightly better than the price reached at the end of last week. Amongst foreign descriptions, the feature is a recovery of 6 points in Anglo-Argentine Tramways 5 per cent. debenture stock. The price now stands at 37½, or nearly 10 points higher than the level to which the quotation fell a fortnight ago. The improvement is due to bargain-hunting on the part of a few speculative purchasers, who think that the visit of the Royal Princes to the Argentine Republic may prove of benefit to the British companies working in that country. Mexico Tramway bonds at 52½ are 2 points lower. Brazilian Tractions show an improvement. American transport and utility shares are generally higher. Shawinigans at 57½ and Power Corporations at 57 reflect the improved tendency. Amongst iron and steel shares, Babcocks weakened to 47s. 6d., but recovered their slight loss. Vickers, after a dip to 6s. 6d., rallied to 6s. 10½d. No alteration has occurred in the rubber market position.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price Feb. 24 1931.	Rise or fall.	Yield p.c.
Bournemouth and Poole	£ 1	15	15	3	−½	5 0 0
Brompton Ordinary	1	8½	8½	28/-	+6d.	5 0 0
Central Electricity 4½% Deb. ...	Stock	—	—	92½	−2	4 17 3
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8⅝	8⅝	28/-	+6d.	5 0 0
City of London	1	10	10	36/3	—	5 10 3
Clyde Valley	1	8	8	33/9	−9d.	4 14 10
County of London	1	7	10	46/3	−2½	4 6 7
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	47/6	−⅛	4 12 7
Kensington Ordinary	1	8	8	29/-	+6d.	4 16 7
Lancs. Light and Power	1	7½	7	23/-	—	6 1 9
London & Home Counties 4½% Deb.	Stock	—	—	92½	−¾	4 17 3
London Electric	1	8½	9	32/6	—	5 10 9
Metropolitan	1	9	10	42/-	—	4 15 3
Midland Counties	1	6½	7	27/6	−1/-	5 1 10
Mid. Elec. Power	1	15	8	31/3	—	5 2 5
Newcastle-on-Tyne Ordinary ...	1	6	6	22/6	−⅛	5 6 8
do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref. ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	28/6	—	4 18 3
Scottish Power	1	8	8	29/6	−6d.	5 8 6
South London	1	8½	8½	28/-	—	5 0 0
Urban Ordinary	1	7	7	29/6	—	4 15 6
Westminster Ordinary	1	8¼	8¼	29/-	—	4 16 7
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	33/9xd	—	4 14 10

Home Rails.

Central London Ord. Assented ...	Stock	4	4	80	—	5 0 0
Metropolitan	,,	3½	4	54½	—	6 8 5
do. District	,	4	5	72½	—	6 18 0
Underground Electric	£1	7	8	23/-	—	6 19 2
do. do. Income ...	Bonds	6	6	104	—	5 15 5

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	108½	—	5 16 0
do. Def.	,,	1½	1½	25½	—	5 17 8
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½% Pref. ...	Stock	—	5½	72	+1½	7 12 9
do. A 7½% Ord.	,,	—	—	21	+½	... ...
do. B Ord.	,,	—	—	12	+½	... ...
Globe Tel. and T. Ord.	10	10	10	11½	.	8 13 10
do. do. Pref.	10	6	6	10½	+½	5 14
Great Northern Tel.	10	20	20	29½	+½	6 15 7
Marconi-Marine	1	12½	15	37/6	+1/2	8 0 0
Oriental Telephone Ord.	1	12	12	23	—	*5 1

Home and Foreign Trams, &c

Anglo-Arg. Trams First Pref. ...	5	5½	5½	1	—	... ...
do. do. 2nd Pref. ...	5	6	6	12/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	37½	+	13 6 8
British Electric Traction Def. Ord.	,,	5	5	1225	−75	... ...
do. do. Pref. Ord.	,,		8	132½	—	5 19 0
Brazil Traction	100	7	8	28	+1	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	97½	+1	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/0	−6d.	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 4
Mexico Trams, 5% Bonds ...	—	5	5	52½	−2	9 10 6
Mexican Light Common	100	Nil	Nil	48½	—	... ...
do. 7% Pref.	100	7	7	67½	+1	10 7 4
do. 1st Bonds	—	5	5	78	—	6 8 0
Victoria Falls Ord.	1	15	15	58/9	—	5 2 0
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	21/-	−1/-	5 14 3
Babcock & Wilcox	1	13	15	48/-	—	*6 5 0
British Aluminium Ord.	1	10	10	29/6	−6d.	6 15 7
British Insulated Ord.	1	15	15	3¼	−⅛	4 12 0
Brush Ord.	Stock	10	10	105	—	9 10 6
Callenders	1	15	15	3	−¼	5 0 0
do. 6½% Pref.	1	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	—	30	28/3	—	6 9 0
do. 8% Pref.	1	8	8	28/-	—	5 14 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	94½	—	5 5 10
Electric Construction	1	5½	5	12/-	—	8 6 8
Enfield Cable Ord.	1	20	25	4¼	−1/8	5 17 8
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref.	1	3	Nil	7/6	—	... ...
Ferranti Pref.	1	7	7	21/6	—	6 10 4
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	10	14	45/-	−1/2	6 4 5
Henley	1	25	30	5½	−1/8	5 5 5
do. 4½% Pref.	5	4½	4½	4¾	—	5 2 10
India-Rubber	1	Nil	Nil	6/3	—	... ...
Johnson & Phillips	1	10	10	36/9	—	5 8 10
Siemens Ord.	1	7½	7½	1⅞	—	7 1 2
Telegraph Construction	12	10	10	16½	—	*7 5 6

*Dividends paid free of Income Tax.

The British Industries Fair—III.

Electrical Associations at Birmingham. Final Instalment of Illustrated Notes.

The Fair closes to-day (Friday) after what appears to have been a successful fortnight. We report below the speeches at the electrical functions, and publish a third instalment of illustrated notes on the exhibits at Castle Bromwich, Birmingham, and at Olympia, London.

The First "Electrical" Day.

Representatives of contractors, wholesalers, consultants and other branches of the electrical industry and profession paid an official visit to the Birmingham section on February 19th and were entertained by the Fair Management Committee at luncheon, Mr. E. W. Bache, vice-president, occupying the chair. After the loyal toast, **Mr. Frank Hodges,** member of the Central Electricity Board, proposed the toast of "Industry." The speaker said that although British industry was justly proud of its great past and was still great, it was to the future that he directed his hearers' attention. The Fair was a living contradiction of the suggestion that we had overtopped our zenith. In spite of the existing difficulties, which were principally due to world causes, there was no need for paralysing pessimism. British resourcefulness and courage had not ebbed with the ebbing of industry. The burning question was whether we were ready for the flood tide when it came—as it soon must come. It was our duty to prepare to handle the business which would be available in a scientific manner. The ship of industry was well manned and with competent navigators in control it would nose its way through to success as this country had done before. Both capital and labour had sense enough to co-operate to save the nation in the present crisis, and finance was willing to assist sound agreed schemes for the resuscitation of industry and for the improvement of its competitive powers. If political dogmas stood in the way of a responsible, well organised industry they would have to be swept aside by the great industrial community. The electrical industry was young and vigorous. The Grid scheme had provided work for manufacturers of transformers and large switchgear, but its influence would reach down to the manufacturers of the smallest appliances. Moreover, the scheme had enabled British manufacturers to work on a scale never before attempted, and in consequence their technique had surpassed that of their competitors. Thus the industry would make itself felt in the markets of the world in a way such as no other industry had done in such a short space of time. Although it was said that British prices and wage standards were higher than they ought to be, this was balanced by the giving of good value for money. The electrical industry could supply to the world articles with a durability and efficiency which would easily out-distance the price paid for them. He looked to the electrical industry to lead British industry back to prosperity.

In responding to the toast, **Dr. A. H. Railing** (General Electric Co., Ltd.) said that it was difficult to reply for industry as at present industry was in the position of a patient whose complaint was being diagnosed by the doctors. He agreed with Mr. Hodges that the country's suffering was mainly due to a bacillus which had spread over the world and a serum was needed to overcome its effects—the maldistribution of gold, the isolation of huge communities such as Russia and the internal dissensions in many States. It was industry's business to provide goods of the right quality and price, and to give service. No country stood higher in the world's estimation than Great Britain. There was perhaps room for improvement in service and salesmanship, but on the whole we were not too backward. Price depended on the cost of raw materials, labour and "overheads," and on quantity production. We bought our raw materials at world prices, but our labour costs and taxation were heavier than those of our competitors. In the matter of quantity production, the American and German manufacturers had large and assured home markets protected by tariff walls. The British manufacturer had no such advantage and the home market was therefore not suitable for quantity production. Nobody wanted to reduce wages or the purchasing power of the country, but if the existing standard of living was to be maintained the products of labour must be protected and quantity production facilitated. This would reduce production costs and increase our business in home and foreign markets. British industry had a remarkably good constitution and all that was needed was a belief in early recovery. He thought that this belief was held by industry, and he concluded by reminding his audience that the well-being of the electrical industry ultimately depended upon the well-being of British industry as a whole.

The E.P.E.A. Visit.

About 300 members of the Electrical Power Engineers' Association visited the Birmingham section on February 21st and were entertained to luncheon. **Mr. T. R. Martin** (chairman of the Electrical Advisory Committee) presided, and pointed out that among the assets of electricity were those of safety and reliability. The Fair provided power engineers with an opportunity of seeing the best practice and equipment that the country could offer.

The toast, "The Electrical Industry," was proposed by **Mr. George Rogers,** chairman of the South Midland Centre, I.E.E., and **Mr. A. E. Ricketts** (president of the E.P.E.A.) replied. He said that the supply and manufacturing sides of the industry were faced with the problem of how far they could go in cheapening the cost of the product without interfering with its reliability. He maintained that the success of the Grid scheme would depend ultimately upon the efforts of the members of the Association.

"Supply" Day at Birmingham.

Tuesday last was another electrical day, several associations, mainly connected with the electricity supply industry, being represented by nearly 400 visitors. MR. T. R. MARTIN, presiding at luncheon, expressed the hope that next year the electrical display would be even more representative than the present one; he pointed out that there was ample scope for expansion.

SIR JOHN BROOKE, proposing "The Electrical Industry" congratulated Mr. Martin and his committee upon the excellent results obtained. Electricity was being increasingly employed in industry and in ships; if we were to take full advantage of the next trade boom we must be fully prepared for it.

In responding, MR. C. C. PATERSON, Pres. I.E.E., spoke of the practical results obtained from scientific research in the electrical industry.

MR. G. M. GILLETT, Parliamentary Secretary to the Department of Overseas Trade, said that the present Fair was a great improvement upon last year's display. It had engendered enthusiasm and optimism and was an enormous help to industry.

Exhibits at Birmingham.

W. & T. Avery, Ltd.

The "Avery" productions shown this year are both varied and comprehensive. For the first time blending machines are represented by a power-driven model fitted with special glass

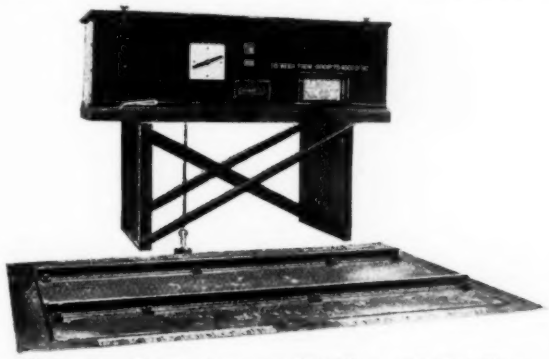


Fig. 45.—The "Avery" Weigher and Totaliser.

inspection windows and coloured interior illumination. The "Avery" weigher and totaliser (fig. 45) which continuously weighs, records, and totals loads moving over the weigh track, is also being exhibited. This mechanism can be combined with belt conveying systems, overhead track, automatic weighers, &c. A mechanical apparatus which is used at Soho Foundry for applying an endurance test to "Avery" visible weighers is being shown in continuous operation, and the range of "Avery" industrial visible weighers is represented by four different types of machine, *viz.*, an overhead track scale, a modern high-capacity dormant machine, a new unit count machine, and a new type milk weigher. Testing machines are represented by two machines especially useful for conditions of mass production. They are a new type direct-reading hardness-testing machine and a visible self-indicating spring-testing machine.

Midland Metal Spinning Co., Ltd.

Upon the front of this stand there appears a battery of electric bowl fires, the novel feature of which is the use of a corrugated reflector.

Berry's Electric, Ltd.

This company's stand is similar in construction to the one occupied last year. It is divided into three main sections, the centre section displaying "Magicoal" fires, one end showing cookers and ironclad switchgear and the other water-heating apparatus of which the company is making a special feature. The "Canvary" water heater is so named as one can vary the temperature of the water as it flows from the heater by moving a small lever. This heater has a solid element with no loose spirals, a non-drip device for the operation of which no valves are required, and a circulating device. The thermostat is arranged for d.c. or a.c., and is designed to operate without the use of springs. The heaters are very efficient, being lagged with high-grade insulating material, and so constructed that the inner cylinder is in no way metallically connected with the outer. The two main types of water heater exhibited are the "Canvary" and "S.P." models. A floor-type heater with a capacity of 11 gallons is shown in fig. 46.

Fig. 46.—A "Berry" Water Heater.

Gent & Co., Ltd.

A large quantity of new apparatus is being shown by this company, one of the most interesting exhibits is a new "Tangent" self-winding clock, suitable for connecting direct to a.c. or d.c. mains. This clock does not depend on the frequency of the supply mains, being operated by its own escapements, and will "carry on" for about 1½ hours if the supply is cut off. Among other new products are a new "Electromatic" a.c. mains clock, a relay for operating motor sirens for fire alarm purposes, &c., a main switch relay (fig. 47) for dealing with heavy power currents from a distance, and a new pressure gauge contact. Other apparatus on show includes "Pul-syn-etic" electric clocks of various designs; "Tangent" flame-proof mining bells, relays, keys of new and improved patterns, telephones, switchboards, shaft signalling transmitter and indicator; liquid level alarms, indicators and recorders; motor sirens for mines, factories, &c.; staff locaters, indicators and bells.

S. G. Brown, Ltd.

This company is concentrating upon its "Electro-Megaphone" which has applications in many noisy situations such as factories, railways, ships, &c. It is claimed that this loud-speaking telephone can transmit messages in a manner enabling them to be heard in the noisiest surroundings, and although there is considerable amplification, the transmission is free from distortion, "side tone" and "cross talk." One of the instruments is illustrated in fig. 48. This is a combined transmitter and receiver, incorporating a portable hand microphone and selector switch.

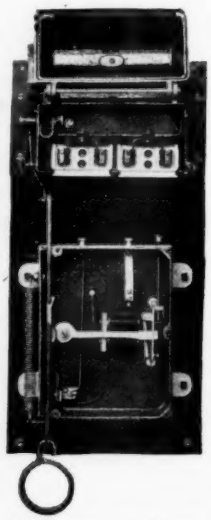


Fig. 47.—A New Main Switch Relay.

Petters, Ltd.

A new and outstanding exhibit of this company is an atomic Diesel marine engine. This type of marine engine operates on the improved two-stroke cycle and possesses remarkable features of constructive simplicity and freedom from the complexities of four-stroke cycle valve gear. The elimination of the mechanically-operated inlet and exhaust valves from the cylinder head is of prime importance to the strength of this part as, thereby, complete symmetry of shape and uniformity of material are secured and unrestricted expansion can take place. In addition to these advantages the special design of combustion chamber which is obtained undoubtedly assists largely in effecting thorough combustion of the atomised fuel and a high degree of thermal efficiency is attained. The engine exhibited develops 160 b.h.p. from the four cylinders at a speed of 330 r.p.m. Another item of particular interest is the latest type of electric starting plug, applicable to all sizes of "Petter" surface-ignition cold-starting crude fuel oil engines in sizes 5 to 36 b.h.p. It is particularly recommended for use in all engines employed for electricity generation, and for marine engines of multi-cylinder type, where it will prove a most convenient and easy method of effecting a rapid start from the cold condition. The other "Petter" exhibits include an instant-starting, 25-b.h.p., single-cylinder, atomic Diesel, stationary, cold-starting, heavy-oil engine; an 18-b.h.p. single-cylinder surface-ignition or hot bulb type, cold-starting, crude fuel oil engine; an 8-b.h.p., single-cylinder, surface-ignition engine direct-coupled to air compressor; a 5-b.h.p. stationary "Universal" hopper-cooled, magneto-ignition, petrol or paraffin engine; a 1½-b.h.p. sectional model of the magneto-ignition petrol engine; a 3-kW direct-coupled electric generating set comprising a 5-b.h.p. surface-ignition engine and electric generator mounted on a continuous cast-iron bedplate; a 3-b.h.p. "Universal" engine and 1¼-kW belt-driven generator with switchboard and batteries; and an automatic electric lighting plant.

Fig. 48.—A Brown "Electro-megaphone."

Barrett & Elers, Ltd.

Upon this stand there appears a collection of moulded insulation parts. The electrical mouldings include a one-piece adaptor of original design.

Charles Lathe & Co., Ltd.

This company exhibits examples of its "Claco" electric fires mounted in fireplaces of its own design and construction.

Hotpoint Electric Appliance Co., Ltd.

The exhibits on this stand comprise a complete range of the latest "Hotpoint-Falco" domestic electric cookers, all of which are finished in mottled grey vitreous enamel. Models suitable for families from 2-3 persons will be shown, as well as double-oven ranges suitable for large country houses, small restaurants, &c. In addition, the company is introducing an entirely new "Hotpoint-Falco" cooker to meet the demands for a small model for hire purposes or for small housing estates, this also being suitable for three persons. The "Midget" (fig. 49), as this new model is called, will generally comprise one totally-enclosed boiling plate with three-heat control, one grill element mounted above the oven with three-heat control, and a good-sized oven also with three-heat control. Also exhibited is the "Hotpoint-Super-Automatic" electric kettle. This kettle incorporates an element of the patented "Hotpoint Calrod" sheathed wire type, and is fully automatic. A large number of electric fires, irons, toasters, and other small domestic appliances are also on view.

Rawlplug Co., Ltd.

Upon this stand there are shown "Rawlplugs," "Rawlplug" bolt anchors, wall-boring tools, four distinct lines of bathroom fittings, "Durofix," a waterproof adhesive, plastic wood (wood in putty form), liquid porcelain, cellulose enamel in a full range of colours, "Duramend," for invisible mending, and "Komposill." "Durofix" is an article which the electrical trade is using very freely because it is a good insulator as well as adhesive.

Fig. 49.—The Hotpoint-Falco "Midget" Cooker.

Dallow, Lambert & Co.

This company's principal exhibit is an industrial vacuum cleaner possessing several novel features. The equipment is illustrated in fig. 50. As will be seen from this the container is mounted on caster wheels. Suction is obtained by means of a fan of special design, driven by a 0.5-h.p. motor in the standard model. After passing through the tubing, all dust, &c., enters an intercepting chamber which collects the heavy material. Above this interceptor is disposed vertically a series of open-ended filter bags which collect all light dust. These bags are mechanically shaken while the apparatus is in operation and so deposit their dust in the settling chamber without the removal of bags as is common in other types of cleaner. A full set of nozzle equipment is provided with the machine.

In addition to this the company is showing fans, sheet-steel piping, cyclones, filters, &c., which are incorporated in wood-

refuse-, dust- and fume-exhausting, and ventilating plants, together with a working model of a combined cyclone and air filter, in which the path of dust during separation can be followed.

Birmingham Electric Supply Department.

Several electrical manufacturers occupy space on this stand. The largest exhibit is that of WILD-BARFIELD ELECTRIC FURNACES, LTD. The principal item is a Gibbons-Wild-Barfield furnace with an electrically-operated door and automatic temperature control. A "Brookhirst" control panel is employed and a "Crypto" motor operates the door. A 5.8-kW high-speed steel-hardening equipment is shown. This comprises a preheating/tempering chamber and a high-temperature chamber. An automatic hardening equipment with an output of 68 lb. of parts per hour and a consumption of 7.8 kW is shown.

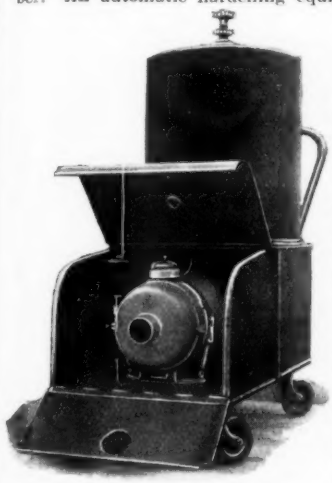


Fig. 50.—An Industrial Vacuum-cleaning Plant.

Another exhibitor upon the stand is BRITISH ELECTRIC WELDING MACHINES, LTD. This company shows a butt welder, a spot welder, and a three-head rivet heater. Stress is laid on the fact that these "Stronghold" machines are of fabricated construction, being built from steel plates and standard sections by means of arc welding. All parts carrying the line voltage are totally enclosed for the protection of the operator.

FERRANTI, LTD., show examples of their transformers, instruments, and fires on this stand. JACKSON BOILERS, LTD., have an operating example of an electric urn for canteen use, while other canteen equipment is displayed by the CREDENDA CONDUITS CO., LTD. A large thermal storage system by A. REYROLLE & CO., LTD., is a further interesting exhibit. A collection of electrically-driven tools (drills, grinders, &c.) is shown by the VIDAL ENGINEERING CO., LTD. A magnetic separator is shown in operation by the RAPID MAGNETTING MACHINE CO., LTD.

Oldham & Son, Ltd.

Accumulators for use in a number of directions appear on this stand. Among the equipment for use in mines is a new gas detector lamp. This comprises the company's standard accumulator lamp with a neat gas-detecting device incorporated in the rear of the body. There is a small electrical igniter for the oil flame and an auxiliary inspection bulb for illuminating the gas-detecting chamber. The whole equipment is securely and simply locked by the sealing of the lid. The company's standard 6-V lamp for gate-end lighting, illumination of the coal face, &c., is arranged to take three standard cells—thus obviating special cells and charging arrangements. In the centre of the stand an example of a new house-lighting battery is on view. A number of novel features are incorporated in the cell employed. It is closed in by a special porcelain top sealed by means of a rubber gasket. There are recesses at each end from which the plates are suspended. The assembly is firmly locked in position by eccentric lug bushes and the plates are secured in position in the glass container by lead buffer springs. Yacht-lighting batteries and a special 200-Ah battery for "talkie" installations are also exhibited.

Sturge & Baker, Ltd.

This company again shows a variety of small electrical appliances, including towel-airers, bed-warmers, fires, lighting fittings and automatic cable winders. The towel-airers are of a new design consisting of an insulating framework in which is fitted a heated cylinder. The element employed is of the low-temperature type. Among the new fires is the "Maltese Cross" pattern, the reflector of which has three triangular faces, the element, of novel shape, being fitted in the base. Chromium plating is employed in this and other of the company's fires.

Donovan & Co.

This exhibit is similar in many respects to that staged by the firm last year. Examples of "Safuse" heavy switch- and fuse-gear are erected on the stand. One new feature is a three phase four-wire switch-fuse with a switched and linked neutral, so arranged that the latter is broken last when switching off and put in circuit first when switching on. The a.c. automatic "across-the-line" push-button starter for a squirrel-cage motor which is on view is of fairly recent introduction. Among the special features incorporated in this design are a one-piece arc hood which prevents flash-overs on severe service. When this is removed the four pole contactors swing down for easy inspection of contacts or coil replacement. The thermal overload release fitted is of the solder type for which a number of advantages are claimed. The overload relays can be re-set from the outside of the case and the panel can be removed from the case without disturbing the conduit. A complete wiring diagram is pasted in the lid of the case.

Tangyes, Ltd.

Examples of the company's single-cylinder oil engine generating sets appear on this stand; these are made in three sizes—2½, 4 and 6 h.p. There is also a 12-h.p. twin-cylinder set. There also appear on the stand examples of the range of the company's horizontal engines, which are made in sizes from 6 to 500 h.p. A notable exhibit is a low-compression horizontal heavy oil engine with a high-compression starting device which gets the engine going in about 15 seconds. The governing arrangement employed embodies a by-pass fuel valve which obviates any alteration of the pump stroke.

Young, Osmond & Young, Ltd.

"Unity" tubular electric heaters naturally form the bulk of this display, and many types and arrangements are shown. These include skirting heaters, car-bonnet heaters, radiators, and floor and wall type towel rails. Other exhibits are a complete thermostat demonstration panel, thermostats for currents up to 10 and 15 A, a gastight heater, a copper-bronze shop-window heater, bus-bar connectors, &c. Examples of the company's new water heaters are exhibited. These are made in five sizes ranging from two to 24 gallons with loadings of from 500 to 1,500 W. The case is of flat rectangular shape, which is a considerable advantage when the heater is mounted on a wall. The finish is heavy white enamel with chromium-plated fittings giving the appliance a very clean and handsome appearance. An anti-drip device incorporated in the design prevents the wearing and discoloration of basins and baths.

Ellmar Mouldings Co.

This company is a subsidiary of Messrs. Hollings & Guest, and its display comprises all kinds of mouldings, including a few electrical and radio parts.

Davey, Paxman & Co., Ltd.

This company is showing one of its six-cylinder "VX" type totally-enclosed heavy-duty oil engines (fig. 51). This engine has a normal power of 300 b.h.p. at 600 r.p.m., and is shown direct-coupled to a 200-kW d.c. "Metro-Vick" generator, the whole being mounted on an under bedplate forming a very compact unit. This type of engine presents a new departure from the ordinary type of medium power crude-oil engine, and has been designed with a view to providing an engine intended for the heaviest duties, which at the same time embodies the utmost facilities for accessibility, minimum of attention and upkeep. The arrangement of the main framing is such that, after removal of the large end bearing, the piston and rod can be lowered complete into the crankbed and then drawn out sideways. This can be done without removing the cylinder head or disturbing any piping or valve gear. These engines are built with from 3 to 8 cylinders with powers up to 400 b.h.p. at 600 r.p.m. Engines of six and eight cylinders can be arranged for automatic starting in conjunction with special relay gear and form excellent stand-by sets for hotels, theatres, workshops, &c. This type of engine is also built in a modified form of steel framing for traction and all similar purposes where it is essential that the framework of the engine should be built to withstand severe and continual vibration. A section of the steel framing is on view, and reveals the extremely robust yet light nature of the framing and the manner in which the stresses are absorbed. The adoption of fabricated steel framework for Diesel engines marks the latest development in the construction of high-duty engines, and the increasing use to which it is being put to replace cast iron is well exemplified in the all-steel sectional boiler also exhibited on this stand.

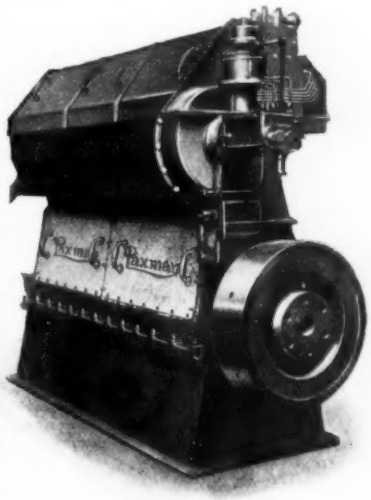


Fig. 51.—The "VX"-type Totally-enclosed Oil Engine.

The National Accumulator Co., Ltd.

This stand is divided into two distinct sections to show the separate exhibits of the company's subsidiaries—the D.P. Battery Co., Ltd., and the Tudor Accumulator Co., Ltd.

The exhibits of the D.P. Battery Co. consist of "D.P." and "Kathanode" batteries for practically every purpose, including country-house lighting, power stations, telephone exchanges, electric trucks, electric vehicles and locomotives. A complete 25-volt battery installation as supplied for country-house lighting is shown, half of the cells being of the usual open type and the remainder of a sealed pattern, thus enabling a battery to be supplied in a fully-charged state complete with acid. "Kathanode" traction cells are displayed in sizes ranging from low-capacity batteries for small trucks, 'bus lighting and other purposes to large ones with capacities of 700 or 1,000 Ah as fitted on large electric shunting locomotives. There are also cells shown in section, together with component parts. The operation of an emergency lighting battery is demonstrated by means of a "D.P. Katholite" emergency equipment.

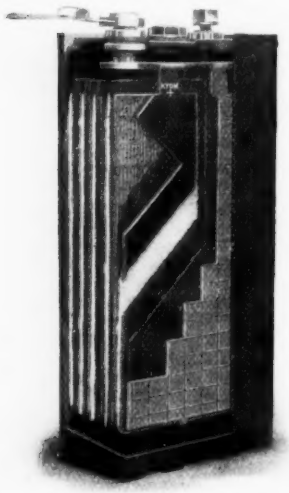


Fig. 52.—A "Tudor" Battery for Traction Purposes.

The Tudor Accumulator Co., Ltd., is exhibiting accumulators for all purposes, including central stations, traction work (fig. 52), train lighting, country-house lighting, telephone exchanges, &c. Another exhibit is a complete house-lighting battery, consisting of 14 cells of the sealed type. There is also a display of Planté plates, marine-type cells, submarine cells, and batteries in glass and lead-lined wood boxes.

Falkirk Iron Co., Ltd.

Examples of the new "Trilite" imitation coal fires are shown by this company. Two of them are mounted in very handsome surrounds. The body of the fire is of rustless steel of pleasing design and the elements are fitted in a canopy, a reflector back being employed to throw out the heat.

Hollings & Guest, Ltd.

Large hydraulic presses are again exhibited by this company. These include two examples of hot-plate presses suitable for the production of bakelite and similar mouldings. Other machines shown include a scrap-metal bundling press, a set of hydraulic pumps driven by chain from an electric motor, suitable for use with the presses mentioned above, a hydraulic accumulator, &c.

A. W. Beuttell, Ltd.

Three new "Linolite" fittings for shop lighting are included in this exhibit, *viz.*, a bronze reflector for covering type "B" showcase "Linolite," a weatherproof facia lighting reflector and an attractive shelf sign. Another item also being shown for the first time is the "No. 2 Linolite." This has been designed to take a 100-watt double-ended tubular lamp, and consists of "Linolite" porcelain lampholders mounted on a bright metal channel. It is supplied ready wired with either an open or closed channel, and is very suitable for decorative lighting behind glass panels, building into electrical fittings, sign lighting, and all instances where no reflector is required. The standard "Linolite" and "K-Ray" advertising signs are also on view.

Taylor & Challen, Ltd.

One of the most interesting exhibits of this company is a press specially designed for the manufacture of bakelite and plastic insulator pressings. This machine shown is a self-contained power-driven unit, the finished mouldings being automatically extracted without removal of the dies or moulds. The upper and lower platens on which the tools are mounted are electrically heated, the temperature being controlled by thermostats. In order to give the necessary time for the bakelite material to set under pressure, the press slide automatically dwells under load at the bottom of its stroke, with the dies closed. This method of producing bakelite products appeals to those makers who wish to use electric distribution for both heat and pressure. A new turntable feed press which is also shown has several advantages over the old types of machine. One die only is needed, the articles being placed accurately in position by the carrier plate. The article when pressed is pushed up from the die into the carrier plate again by a bottom extractor. A number of other models of presses for various purposes are also displayed.

Watford Electric and Manufacturing Co., Ltd.

This exhibit illustrates the principle of specialisation, the company manufacturing nothing but solenoid-operated automatic or remote-control gear for use in conjunction with machine tools, printing presses, air compressors, &c., and typical examples of automatic control panels for push button operation are shown. The eddy drag starting time-retarding devices applied to the Watford multiple-stop starting rheostat are in primary evidence throughout the whole range of equipments. The exhibits include a typical marine type bulkhead mounting control panel. This is one used in conjunction with forced-lubrication pumps driven by a d.c. variable-speed motor. A standard type printing-press control panel is shown; this has a master controller with pushes marked "Run" and "Inch" and a lever of the knock-off type, to stop. A new departure in lift controllers for d.c. motors is shown. The equipment comprises a four-floor lift controller embodying four relays for stopping and reversing contactors for the motor, used in conjunction with a special automatic rheostat to accelerate the motor up to full speed, and on stopping, this rheostat in its return is designed to close a divertor circuit across the armature, first with a high ohmic value and gradually reduce this so as to get very smooth deceleration to a slow crawling speed. A patented selective relay cuts resistance out of the divertor circuit if the motor is driving a light load, cuts resistance out of the series resistance circuit if the motor is driving a heavy load, or permits the motor to stop with the normal divertor resistance and series reducing resistance. Other gear exhibited includes wheel lathe control panels, a standard a.c. pump control panel and float switch, and a complete range of the company's d.c. and a.c. contactors.

Henry Hope & Sons, Ltd.

An imposing structure, consisting mainly of glass, has been erected on this stand. Its interest to our readers lies in the fact that the building is fitted with push-button controlled electrically-operated window opening gear supplied by PAGE ELECTRICAL EQUIPMENTS.

P. M. Braidwood.

On this stand a device is shown by which an extra lamp can be connected to an existing lamp point and be separately controlled. It is useful for the installation of a bed light as it does not involve alterations or additions to the wiring.

Hick, Hargreaves & Co., Ltd.

This company is exhibiting two rotary compressors direct-coupled to motors. One of these (type R.C. 10) is a motor-driven single-stage water-cooled compressor with a capacity of 325 cu. ft. of free air or gas per minute at a pressure of 30 lb. per square inch, and a speed of 720 r.p.m. It is capable of working up to a pressure of 60 lb. per sq. in., and has actually run to a pressure of 70 lb. per sq. in. The motor is of B.T.-H. manufacture, 40 h.p., direct-coupled, suitable for a.c. supply, 400-440 V, 50 cycles. The other machine is a motor-driven two-stage rotary compressor (type R.C.C. 2/1), with a capacity of 35.5 cu. ft. of free air per minute at a pressure of 100 lb. per sq. in. and a speed of 1,450 r.p.m. This set is arranged with the inter-cooler above the cylinders and is fitted with the company's latest automatic control valve, air suction filter of the "Vokes" type, and mechanical lubricator, direct-driven. This machine is the company's standard design and speed, but it is building the same size of machines specially arranged for direct-coupling to a.c. motors at a speed of 1,925 r.p.m. and capable of being switched direct on to the line. The motors are for a.c. supply, 220 V, 3-phase, 33⅓ cycles. Fig. 53 shows the type R.C. 10 single-stage compressor direct-coupled to a Mather and Platt motor.

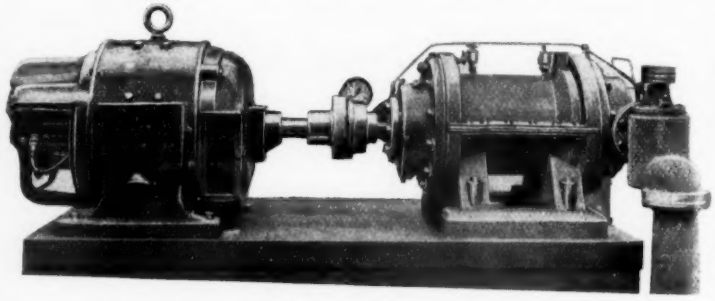


Fig. 53.—Hick Hargreaves Rotary Compressor.

Newalls Insulation Co., Ltd.

The whole of the products exhibited are entirely new and relate only to the new departure of the company in insulation, *viz.*, the production of material specifically designed for purposes of sound insulation and other acoustic work. These consist, in the main, of two new products—"Paxboard" and "Paxfelt"—which are manufactured in various modifications according to the requirements of the work concerned.

A. P. Lundberg & Sons, Ltd.

This company is showing a comprehensive range of its numerous patterns of switches, plug connectors, switch plugs, and kindred accessories. Among the exhibits is the "Got It" switch plug, an interlocked earthing pattern of the three-pin type. The contacts on the base for the plug are of the spring-socket type, with solid-ring entry, and are formed in one piece with the terminal, being arranged on the "floating" principle. The switch movement has a positive quick-make-and-break action. The plug fitted is of the "Minimax" handshield pattern of bakelite, made in accordance with B.E.S.A. Specification No. 372, and it allows the minimum and maximum diameters of flexible to be gripped satisfactorily. It is impossible to switch on before the plug is inserted, and the plug cannot be withdrawn while the switch is on. Flush and surface patterns are available. In addition, the company shows the "Unitem" b.c. adapter (either b.c. or two-pin), which has been re-designed in bakelite and contains several improvements; the new rocker of the "Marvel" switch in bakelite, arranged with knife-blade contacts; the "Dual Grip" b.c. adapter in bakelite, arranged for circular cord flexibles (fig. 54); a new switch with underslung movement and quick-make-and-break action; a new pattern of "twinob" switch with quick-make-and-break action, and of "arc-groove" construction; the "Tripolit" interlocked switch plug (3-phase and "earth"); b.c. adapter for earthing, and many other articles.

Fig. 54.—The "Dual Grip" Adapter.

Turners Asbestos Cement, Ltd.

Several grades of "Sindanyo" and "Siluminite" insulating material are represented in this display. The ebony grade "Sindanyo" is suitable for switchboards, &c., and can be given an excellent black enamel finish. Examples of boards which are being supplied to the English Electric Co., Ltd., and the Portsmouth Corporation, are shown. The natural grade "Sindanyo" is used for such purposes as arc shields, h.p. cubicle doors, &c. "Siluminite" mouldings for various applications form a considerable part of the exhibit. They range from articles in "Grade 2" which possesses excellent insulating and heat-resisting properties down to "Grade 6," which is of a less expensive character. Asbestos paper, tapes and tubes of various qualities are also on view. A view of a large "Sindanyo" board appears in fig. 55.

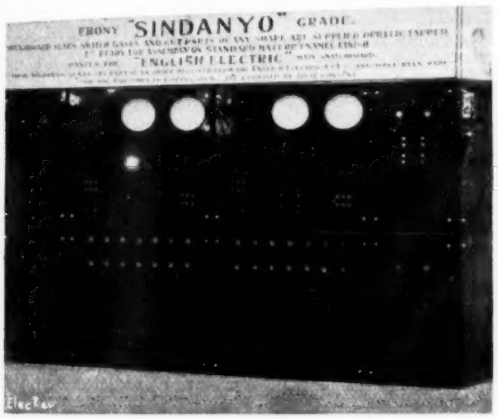


Fig. 55.—A Large "Sindanyo" Switchboard.

W. T. French & Son.

Many improvements have been effected throughout the whole range of "Mysto" fires. The most important of these is the wiring, all models now being fitted with new type fire bars which carry the elements in a horizontal direction in place of the old vertical type. These improvements give greater efficiency and more concentrated heat output for current consumption, and have necessitated all models being enlarged. Several new fires are being shown, the most important of these being the new "Flicker" fire. The imitation coal top is well laid out, and the mechanical arrangements are designed to give the best possible effect on the curved reflector screen. The fire is fitted with a control switch to each bar. In addition, there are two new models of the "Flicker" type, based on Old English designs of the dog grate type in cast iron, which will be supplied in oxidised silver or armour bright. A new bowl fire is also being shown, as well as the "Mysto" boiling plate and plate warmer.

C. H. Parsons, Ltd.

This company, one of the regular exhibitors at Birmingham, again displays numerous examples of its "Britmac" electrical accessories. These comprise tumbler switches of all kinds, switch-plugs, ceiling plates, lampholders, &c. Some very handsome bakelite fittings in a variety of colours are shown. One of the latest productions is a combined quick-make-and-break switch and plug which is made in 5- and 15-A sizes. These are made in shock-proof material—white, black and brown. In a new two-pin switch-plug a hollow-back base can be used which obviates the necessity of using a block. A brown bakelite two-pin plug top shown is made in two pieces, doing away with a fibre plate and facilitating wiring. Another exhibit is the "E.A." patent cord-grip lampholder and the company is now producing two new B.E.S.A. switch-plugs with bases recessed at the back.

National Gas Engine Co., Ltd.

The principal exhibit of this company is an "RV4"-type vertical oil engine. This is a four-stroke, four-cylinder, cold-starting, totally-enclosed engine, designed to run on cheap heavy oil, developing 110 maximum and 100 constant b.h.p. at 600 r.p.m. The bedplate and column are each cast in one piece, large inspection doors being provided at the front and back of the column for easy access to bearings, &c. The cylinder heads are water cooled, and are fitted with exhaust and inlet valves of special steel. These heads can be removed without dismantling the air and exhaust pipes. Each cylinder has a separate pump and spray valve. Lubrication is under pressure, and the camshaft runs in a separate oil bath. The water-cooling arrangement is of the open type. Engines of this design are manufactured with 2, 3, 4, 5 and 6 cylinders, with a range of power from 50 to 150 b.h.p. A heavy oil engine specially designed for the small power user is also displayed. This model develops 17 maximum b.h.p. and 16 constant b.h.p. at 375 r.p.m.; it will run on cheap oil, and start from cold without any preheating. The fuel supply is under the control of the centrifugal governor, and atomisation is obtained by the combination of the fuel pressure and the atomiser. Other items of interest include a representative selection of the company's large range of petrol-paraffin engines, pumps and compressors.

J. H. Tucker & Co., Ltd.

This year the company is showing several new lines not previously exhibited, and particulars of the more important of these appear below:—The "Twin-Titan" switch combination, illustrated in fig. 56, consisting of two one-way or one one-way and one two-way 5-A all-insulated "Tucker-Titan" switches mounted side by side on the same base and under one cover. "Luminous" dolly switches of the surface, semi-recessed and sunk types, 5-A size are exhibited. New pattern B.S.S. two- and three-plate ceiling roses are shown in miniature and standard sizes in white and brown porcelain. Another item is a flush-type combined switch socket, rated at 15 A, for horizontal mounting, fitted with the company's standard heater-type switch with footpress dolly. The complete unit, including the necessary iron box for mounting, is sold under the name of the "Edinburgh Unit." Switch-plates, from one to four ways, in brown, white, and old ivory moulded "Telacite," with etched borders, are on view. These plates are also available for use with 2- or 5-A sockets. The main improvements in the re-designed 5-A tumbler switches shown are: The dolly is now pear shaped and of larger dimensions, with an increased leverage, providing a smoother movement; the switch movement of both "B. 100" and "B. 4,000" switches has been improved, reducing the "snap" and increasing the smoothness of the action. Other exhibits are a new range of small H.O.-type fuseboards in teak or iron cases, rated at 15 A at 500 V; 5-A double-pole (single base) quick-make-and-quick-break tumbler switches in surface, semi-recessed, and sunk pat-

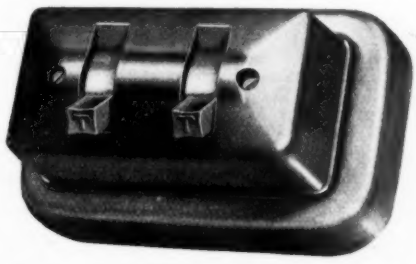


Fig. 56.—A Tucker "Twin-Titan" Switch Combination.

terns; and a surface-type combined switch socket. Both switches and combined switch-sockets are available in the "all-insulated" types. The company is also showing a full range of its standard lines.

British Electric Transformer Co., Ltd.

Two new cookers which are included in this company's display are dealt with elsewhere in this issue. In addition to these, examples of all the "Tricity" lines are on view including irons, kettles, toasters, &c. The various types of "Sunray" apparatus are represented and there is a good display of "Kye" electric lamps.

Springvale Electrical Co.

This firm are the official electrical contractors to the Birmingham Section, and have been responsible for the very complicated and extensive installation throughout the huge building. The temporary plant installed includes 300-kW of rotary convertors and 100 h.p. of motors on exhibitors' stands. Upon the latter 7,000 60-W and 4,000 100-W lighting points have been installed. The general lighting (main building, dining rooms, &c.) and the illumination of the car parks, involved the installation of 300 500-W points. The electrical kitchen equipment was installed in eleven days, and the whole of the other work was carried out within two months.

Exhibits at Olympia, London.

Baird & Tatlock (London), Ltd.

Among an interesting range of scientific instruments shown by this firm is an electrically-heated device for the analysis of coal carbonisation as used at the Greenwich Fuel Research Station. An electrically heated seed-testing incubator is also included in the display.

British Celanese, Ltd.

"Celastoid," a celluloid preparation in both transparent and opaque colours for insulation and other purposes, is to be seen in sheet and tube forms at this stand. "Cellastine," a cellulose-acetate moulding composition for producing insulating mouldings of all kinds down to a thickness of .020 in., is another speciality of this company.

British Hanovia Quartz Lamp Co., Ltd.

At this stand prominence is again being given to the "Homesun" quartz-mercury vapour lamp. The lamp is made for use at any voltage from 50 to 250 volts, from d.c. or a.c. mains, a small portable transformer being supplied in the latter case. Also displayed is the "Alpine Sun" lamp, a more powerful apparatus intended for use only by the medical profession. Another exhibit of interest is the Hanovia "Analytic" lamp which is being largely used for testing raw materials and for the detection of forgeries in cheques, notes, securities, &c. The ultra-violet rays from the lamp are passed through a special filter. The apparatus is also being used for rapid durability tests of varnishes, textiles, and other materials, and also for fluorescence tests.

Cambridge Instrument Co., Ltd.

This display comprises an interesting range of highly-developed scientific electrical instruments, including mains testing sets and thermo-electric temperature measuring and indicating apparatus. Among the latter is one which indicates temperatures from −200 deg. C. to 6,000 deg. C. A Duddell oscillograph fitted with six vibrators, each giving independent records, is shown.

Collaro, Ltd.

This company, which is a large maker of spring motors for gramophones, also exhibits a recently-introduced induction-type electric motor for the same purpose. It is a compactly-arranged machine, the unit comprising the necessary worm gearing; the motor is adapted to be supplied with power off any 100-130 or 200-260-volt a.c. circuit, a small change-over plate being provided.

Dowsing Radiant Heat Co., Ltd.

This company is again present with a varied and interesting display of electrical appliances. Bowl fires are available in several patterns, among which are two firescreen models. Kettles, urns, saucepans, and curling tong heaters all find a place among the home appliances, as well as boiling and hot-plates, irons, &c. On the industrial side are a number of small electrical devices such as tailors' and laundry irons, a hat brim ironer, and branding irons. A cordless ironing outfit is exhibited. In this, ordinary irons are electrically heated on a small stand fitted with the necessary switches and safety devices. Several other appliances are also on view.

J. J. Eastick & Sons.

"Eelex" terminals and other small components for use in connection with radio apparatus are again displayed by this firm. The articles are available separately or made up in cabinet form for convenient display by traders. A useful device is the "Eelex" testing "prod," which consists of a pair of metal points that are entirely shrouded when not in use, but can be quickly exposed by finger pressure on the spring-loaded upper ends.

Garrard Engineering and Manufacturing Co., Ltd.

To meet the growing demand for electrically-operated gramophones, this firm is now turning out large numbers of small electric motors complete with 12-in. turntables. Two types are available, one being designed for use in conjunction with either d.c. or a.c. mains at any pressure between 100 and 250 V, while the other is an induction-type motor for a.c. circuits. Both of these miniature machines are provided with automatic starting and stopping switches and speed regulators, while the universal machine is supplied with either a plug-in or slider-type resistance.

Franco-British Electric Co., Ltd.

Electrically-illuminated signs of all kinds are the speciality of this concern, which has on view an interesting variety of "Franco" fixed and moving signs, neon-tube signs, special letters for shop signs illuminated by reflected light from an electric lamp fitted in the centre, and some ingenious multi-switch flashing signs.

Hall Telephone Accessories (1928), Ltd.

Prominent at this stand is a standard red-painted telephone call-box fitted with the company's coin-collector box complete with the necessary electric signalling connections as supplied to the G.P.O. The company also shows a projector combined with a continuously-moving band of film for publicity purposes.

Charles Hearson & Co., Ltd.

Electrically-heated and controlled laboratory apparatus for industrial research in a variety of forms is shown at this stand, prominence being given to drying ovens. In one example the temperature is controlled by one of the firm's long-range thermostats, which is enclosed by a metal and glass cover protecting the device and its platinum contacts from dust and damage. The oven is made in four sizes ranging from 12 by 9 by 9 in. to 22 by 15 by 15 in. Other Hearson specialities include a temperature-controlled cabinet for moisture testing, an oven for conditioning and accelerated ageing tests, a biological incubator, an electric quick-drying oven for moisture-content determination, and electrically-driven centrifuges.

Ideal Home Electrical Appliances, Ltd.

This is a company which specialises in electro-medical appliances of all kinds, including fixed and portable h.f. violet-ray "Vitalators," "Alpine" ultra-violet radiation apparatus, ozonisers, hair dryers, massaging equipment, &c.

Imperial & International Communications, Ltd.

Included in the display of this company are some of the instruments and regenerating apparatus used in connection with the transmission of messages by cable telegraphy.

K. F. M. Engineering Co., Ltd.

This firm specialises in the production of tubular lamp-holders and reflectors for the lighting of show cases, shop windows, pictures, &c. The lamps, of varying lengths and capacities, are held between end blocks, obviating the use of flexible conductors between the ends of the lamps. Illuminated glass and box signs, as well as a variety of letters and day-light signs, are also displayed.

Lissen, Ltd.

This company occupies a large stand with examples of its wide range of products for the radio trade, including dry batteries, accumulators, valves, condensers, loud-speaker units, &c. Complete receiving sets and radio-gramophones of the all-mains and battery-operated types are also displayed. Bakelite and other moulded parts are shown.

M. L. Magneto Syndicate, Ltd.

This stand is again devoted largely to a display of radio specialities, and particularly to the M.L. small d.c. to a.c. rotary transformers for use in connection with a.c. mains-operated receiving sets. Other exhibits of interest include anode convertors intended to replace batteries in low-power transmitting and receiving sets, an air-driven generator for wireless transmission purposes on aeroplanes, combined motor-generator sets ranging in output from 15 to 170 watts, electrical tachometers, and the M.L. pneumatic electric safety lamp for use in collieries, &c. Moulded electrical and wireless parts in bakelite, &c., also appear.

George Nobbs, Ltd.

"Genii" electric tubular heaters for the warming of rooms, cupboards, &c., occupy a prominent position on this stand. They are made in lengths of from 2 to 17 ft. and in capacities of from 25 to 70 watts per foot run. The company also displays a range of "Genii" immersion heaters which are made in single-, double-, and four-bladed patterns, and in capacities from 100 to 9,000 W. Among the many forms of electric water heater in view is a new "P.S.A." type made in 2½- and 5-gallon sizes. The outer casing of the heaters is finished in white enamel with chromium-plated fittings. The small size, which has a loading of 750 watts, is capable of supplying about two gallons of boiling water per hour, and the larger, 1 kW size, three gallons per hour. Both heaters are fitted with a switch which automatically cuts the current off and on as water is used. Other "Genii" specialities exhibited include wash-boilers, distillers, sterilisers, &c.

Peerless Electrical Manufacturing Co., Ltd.

Among the machines displayed on this stand are one for mixing cakes for confectioners, a mincing and sausage-making machine for butchers, and coffee grinders for grocers. The various appliances are driven by small ball-bearing electric motors, which, together with the necessary gearing, are entirely enclosed.

Restlight, Ltd.

An interesting display of the various applications of "Restlight" glass is made by this concern, which also exhibits the "Lamplough Daylamp" for the accurate matching of colours.

Sheringham Daylight Co. (1930), Ltd.

This is another concern specialising in the production of shades and reflectors designed to provide artificial daylight. In the Sheringham system, the result is obtained by spraying the undersurface of the reflectors with blue, green and yellow pigments in accordance with a formula which regulates the respective areas and dispositions of the pigments. The system is shown applied to reflectors for factory, office, and general industrial use, as also for schools, institutions, and private houses.

Synchrophone, Ltd.

What may fairly be described as the most up-to-date machine for providing entertainment is the "Synchrophone" (see ELEC. REV., February 20th, p. 354) inasmuch as it combines in the one instrument an all-mains, 4-valve radio receiving set with a loud-speaker, gramophone, a projector for 16 mm. kinematograph films, and a home "talkie" mechanism, the whole being enclosed in a handsome cabinet measuring 49 by 22 by 22 in. The kinema unit is provided with a small universal (d.c. or a.c.) electric motor and a 250-watt lamp with special lens to throw a 36 by 27 in. picture on a screen at a distance of about 11 ft.

P. W. Taylor.

The "Gordon" 10-cwt. electric truck, which has been adopted by a large number of dairy concerns for the delivery of milk, appears on this stand. The vehicle is of a low-built, three-wheel type, the electric motor being mounted at the side of the single front wheel. The necessary current is supplied by a 60-volt battery of "Ediswan" accumulators mounted below the chassis, the capacity being such as to allow a distance of 15 miles to be covered on one charge. At this stand are also to be seen examples of the B.T.H. "Tungar" battery chargers.

Insulating Mouldings and Moulding Materials.

One of the features of the Fair is the great increase in the number of exhibitors of insulating moulding materials and mouldings for electrical and wireless parts, which are now grouped together in "B" section. The ACETATE PRODUCTS CORPORATION, LTD., displays "Acetoid" mouldings in attractive mottled and translucent colours, and cellulose lacquer coatings for cotton-covered wires. BAKELITE, LTD., has a large stand on which are displayed a wide variety of electrical and radio mouldings made from bakelite by various well-known manufacturers. Attention is also being drawn to the bakelite varnish which is now being extensively used as an insulating medium and protective coating for coils, armatures, and windings. The BEETLE PRODUCTS CO., LTD., shows samples of its white and coloured moulding powders, among the examples of finished articles being switchcovers and brackets for both house and ship use, electric table lamps, &c. A. W. KANIS shows a new synthetic moulding material and a variety of articles made of this, including electric table lamps and shades. Other exhibitors of insulating moulding material and mouldings include H. E. ASHDOWN (BIRMINGHAM), LTD.; BEATL SALES, LTD.; the BRITISH XYLONITE CO., LTD.; BROWNIE WIRELESS CO. OF GREAT BRITAIN, LTD.; CASCELLOID, LTD.; CROYDON MOULDRITE, LTD.; EBONESTOS INSULATORS, LTD.; J. B. MOULDINGS, LTD.; INSULATORS, LTD.; KELACOMA, LTD.; the LORIVAL MANUFACTURING CO (1921), LTD.; the ST. ALBANS MOULDING CO., LTD.; the STREETLY MANUFACTURING CO., LTD.; and UNITED EBONITE MANUFACTURERS, LTD.

Advertising Signs and Letters.

Electrically-illuminated and operated daylight and other advertising signs are shown by, among other concerns, the "ATTRACTA" ELECTRICAL CO.; the BRITISH SIGN & DISPLAY CO., LTD.; and the STRAND & INTERCHANGEABLE SIGNS, LTD. The ELECTROMATON CO. displays a combined projector and continuous-moving film band, by means of which advertising messages can be projected on to walls, doors, &c. The W. L. D. ADVERTISING DEVICES, LTD., exhibit an advertising sign for shopwindow use, in which a 60-ft. band containing any desired wording is slowly driven behind a glass screen by a small electric motor. When the band reaches the end of its travel, it is automatically reversed for re-winding back on to the original spool, a shutter, containing an additional message, being meanwhile dropped in front of the exposed portion of the band.

Electric Light Shades.

Another prominent feature of the Fair is the very large number of concerns engaged in the manufacture of electric light shades which are made in a remarkable variety of designs, colourings, and materials. In addition to shades, ALBION SHADES, LTD., has on view a simple yet ingenious shade holder which can be instantaneously fixed to or detached from an incandescent lamp without any screwing or unscrewing of the usual brass rings. In addition to a wide range of standard and table lamp shades in all materials, PHILIP S. SCHULMAN, LTD., have a novelty in the "Dinkilite" combined table lamp and shade made in one piece of parchment and acetate material in various colours. Artistic shades made of non-flammable "Luminaque" for table, standard, and bed lamps are shown by HARRY SCHUMAN, LTD., who also display a novel desk lamp, the arm and shade of which are covered in coloured "Luminaque," an ash tray being combined with the base.

Electric Lighting Fittings.

Electric standard and table lamps form another class of exhibit, of which there are many interesting examples to be seen. S. BLANCKENSEE & SON, LTD., show table designs with silver bases and pillars. ELECTRIC ART SHADES (1929), LTD., in addition to shades of all kinds, has on view some neatly designed table lamps in porcelain and wood. The HARBRIDGE CRYSTAL GLASS CO. displays some interesting glass table lamps with glass domes and arranged for one or two lamps with chain-actuated switches.

Fig. 57.—A Moorcroft Vase Table Lamp.

A stand at which some of the most artistic lamp shades at the Fair are to be seen is that of CHARLES SELZ, who specialises in the design and manufacture of shades to match the pottery and glass table lamps made by well-known firms. Fig. 57 depicts a "Moorcroft" pottery vase lamp with a Selz 18-in. double-frame shade, the blue cornflower decoration of the vase being faithfully followed in the shade.

The Radio Section.

Although not fully representative of the industry, a large part of the "D" section of the Fair is taken up by exhibitors of radio receiving sets, loud-speakers, radio-gramophones, and components. Among the firms represented are KENNETH BROOK, LTD., who, in addition to portable receiving sets, show a radio-gramophone combination, and E. K. COLE, LTD., who display a range of the "Ekco" all-electric two- and three-valve receivers and other radio specialists. EDISON BELL LTD., in addition to receiving sets with from 2 to 7 valves, of both the all-mains and battery types, shows a combined 5-valve radio-gramophone and a new permanent magnet moving-coil loud-speaker. Something in the way of a novelty is to be seen at the stand of the ESSEX AUTO MANUFACTURING CO., LTD., in a combined gramophone and radio receiver, which is operated on the coin-in-the-slot principle.

Argentina's Imports.

Statistics for 1928 and 1929 Compared.

THE Argentine Government has recently issued statistics of the country's foreign trade during 1929. The following table shows either the weights or numbers or the values in gold pesos (about 4s.), of the various descriptions of electrical materials imported in that year, and the figures are compared with those for 1928. The values are those of the Argentine Customs Department. Particulars of the principal countries of origin of imports are in some cases given, from an appendix to the Commercial Counsellor's report recently issued by the Department of Overseas Trade.

	1928.	1929.	Inc. or dec.
Wires and cables, bare (metric tons)	2,480	3,230	+ 750
From United States	1,260	1,784	+ 524
,, United Kingdom	512	710	+ 198
Ditto, lead covered (metric tons) ...	1,684	1,887	+ 203
From United Kingdom	1,221	1,258	+ 37
,, Sweden	283	301	+ 18
Ditto, underground (metric tons) ...	13,081	11,240	−1,841
From Germany	7,800	5,222	−2,578
,, United Kingdom	1,726	1,654	− 72
,, Italy	1,577	2,956	+1,379
Ditto, other (metric tons)	2,291	1,970	− 321
From Germany	1,283	993	− 290
,, United Kingdom	650	515	− 135
Dynamos and motors (metric tons)	4,933	5,150	+ 217
From Germany	2,085	2,163	+ 78
,, United Kingdom	805	744	− 61
,, United States	746	579	− 167
Fan motors (number)	21,640	27,570	+5,930
From United States	9,190	11,714	+2,524
,, Italy	5,642	9,184	+3,542
,, Germany	5,511	5,430	− 81
Insulators of earthenware or porcelain (gold pesos)	183	293	+ 110
Accumulators and accessories (metric tons)	2,423	2,588	+ 165
From Canada	1,464	1,804	+ 340
,, Germany	444	380	− 64
,, United Kingdom	234	169	− 65
Dry batteries (metric tons)	3,560	3,962	+ 402
From United States	2,782	3,146	+ 364
,, Germany	469	568	+ 99
Ammeters and voltmeters (number)	13,670	11,266	−2,404
Wireless telephone apparatus (gold pesos, 000)	1,520	1,890	+ 370
40 per cent. from United States and 30 per cent. from Holland.			
Wireless telegraph apparatus ,,	5	6	+ 1
Other telephone material and apparatus ,,	253	331	+ 78
Other telegraph material and apparatus ,,	40	103	+ 63
Switches, cut-outs, circuit breakers, &c., entered by weight (m. tons)	1,013	1,043	+ 30
From Germany	424	383	− 41
,, United Kingdom	360	407	+ 47
Switches, entered by number (gold pesos, 000)	20	11	− 9
Electric bell pushes ,, ,,	18	21	+ 3
Electric bells ,, ,,	69	63	− 6
Insulating tape (metric tons) ...	102	125	+ 23
Switchboards for bells & telephones (gold pesos, 000)	12	14	+ 2
Vulcanised fibre ,, ,,	34	28	− 6
Incandescent lamps (metric tons) ...	822	918	+ 96
From Holland	385	354	− 31
,, Germany	251	267	+ 16
Meters (number)	13,900	12,020	−1,880
Distribution boards (number) ...	598	909	+ 311
Insulating tubes (metric tons) ...	3,790	4,742	+ 952
From Germany	2,058	2,520	+ 462
,, United States	770	1,233	+ 463
,, United Kingdom	834	761	− 73
Unspecified materials (gold pesos, 000)	74	76	+ 2
Ditto, duty free ,, ,,	2,049	1,582	− 467

Import Trade of China.

Expansion in the Electrical Classes.

IN a review of a recent D.O.T. report on conditions in China (ELEC. REV., January 9th, p. 75) we gave brief particulars of the country's electrical import trade. We are now able to give further details of the electrical and allied imports in 1929. The corresponding figures for 1928 are given and notes of increases or decreases added. The Haikwan tael has an average value of 2s. 10d.

Country whence imported.	1928. Taels (thous.)	1929. Taels (thous.)	Inc. or dec. Taels (thous.)
Brass and yellow metal; bars, sheets, wire, &c.—			
Total	2,036	1,966	− 70
Great Britain	56	29	− 27
Japan	1,360	1,024	− 336
Belgium	8	15	+ 7
United States	15	238	+ 223
Germany	183	196	+ 13
France	7	6	− 1
Copper bars, rods, sheets, plates, nails, and wire.—			
Total	1,115	1,620	+ 505
Great Britain	39	53	+ 14
Japan	754	973	+ 219
Germany	103	222	+ 119
Belgium	35	19	− 16
United States	63	179	+ 116
Electrical materials and fittings.—			
Total	11,307	13,279	+1,972
Great Britain	2,043	1,852	− 191
Italy	79	249	+ 170
Japan	4,177	4,804	+ 627
Canada	15	33	+ 18
United States	1,895	2,441	+ 546
Sweden	9	40	+ 31
Belgium	299	274	− 25
Holland	242	329	+ 87
France	166	190	+ 24
Germany	1,321	1,842	+ 521
Propelling machinery, such as boilers, turbines, &c.—			
Total	2,566	3,441	+ 875
Great Britain	1,192	1,070	− 122
Japan	195	314	+ 119
United States	534	258	− 276
Sweden	42	42	—
Germany	233	1,051	+ 818
Belgium	13	28	+ 15
Italy	68	225	+ 157
Czecho-Slovakia	—	58	+ 58
Telegraph and telephone material, including wireless apparatus.—			
Total	1,848	3,928	+2,080
Great Britain	189	385	+ 196
Japan	291	472	+ 181
Canada	3	16	+ 13
United States	230	1,190	+ 960
Sweden	87	146	+ 59
Germany	234	378	+ 144
Belgium	279	445	+ 166
France	43	218	+ 175
Italy	19	37	+ 18
Scientific instruments and apparatus.—			
Total	1,783	2,402	+ 619
Great Britain	142	180	+ 38
Germany	519	807	+ 288
Belgium	2	8	+ 6
France	37	81	+ 44
Japan	438	624	+ 186
United States	399	454	+ 55
Machinery for electric power stations.—			
Total	1,316	2,532	+1,216
From Great Britain	410	679	+ 269
,, Germany	70	335	+ 265
,, Japan	137	231	+ 94
,, United States	449	561	+ 112
,, Italy	61	176	+ 115
,, Belgium	20	118	+ 98
,, Czecho-Slovakia ...	—	171	+ 171

Scientific and Professional Staffs.

The committee which was appointed by the British Science Guild in November, 1927, to inquire into the functions of the scientific and professional staffs in the public services and in industry from the point of view of efficient administration and national development has published its report, which is obtainable from the Guild at the price of 1s.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New Oil-break Switches.

The following notes are taken from an abridged specification for a range of "F" type oil-break switches, fig. 1, recently introduced by the AIREDALE ELECTRICAL & MANUFACTURING CO., LTD., Bowling Old Lane, Bradford. The maximum voltage and current ratings are 660 and 100, respectively. The mechanism and all live parts are enclosed in a substantial c.i. housing, provided with flanges for fixing on a wall. The c.i. cover is secured to the case by two $\frac{3}{8}$-in. set screws. The oil

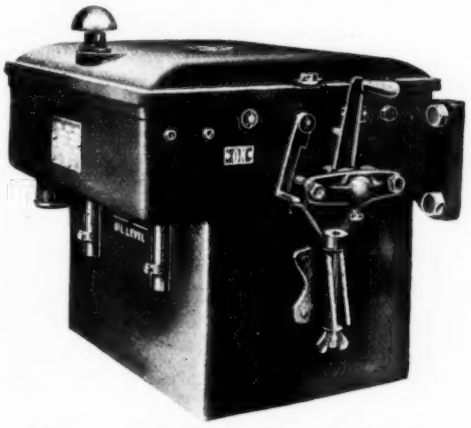
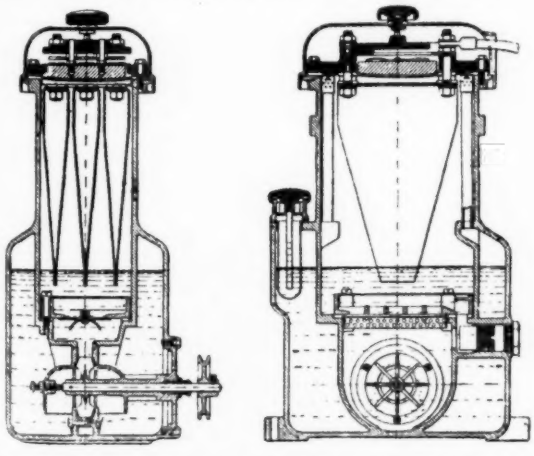


Fig. 1.—"Airedale" L.P. Oil Switch.

tank is of welded sheet steel held in position by two $\frac{3}{8}$-in. studs and wing nuts. The tank lugs are grooved and act as guides, so that the tank may be removed without risk of accidently "shorting" the contacts. The oil level is plainly stencilled on the front of the tank. The fixed contacts are of the controller finger type, and the seven parts, when assembled, form a complete fixed contact. The moving contacts are of the drum type.

Two c.i. brackets bolted to the case support both sets of contacts. The drum contacts are fixed to a bakelite-insulated steel shaft turning in bearings provided on the brackets, and coupled to operating mechanism through a bell crank and steel link. The correct number of fixed contacts are mounted on



Figs. 2 and 3.—Sections of "Planche" Liquid Starter.

round bakelite-insulated steel rods and clamped to the brackets to register correctly with drum contacts. A low-voltage release and an overload trip are provided. The operating mechanism possesses true "free handle" features of very simple design, and does not involve the use of toggles. It is therefore impossible to hold in the switch under a short-circuit or beyond the predetermined overload setting; neither can the switch be closed unless the no-volt coil is energised, if the switch is fitted with such a device. This mechanism is mounted inside the cast-iron housing, and occupies very small space, thus leaving the remainder of the interior clear for the incoming and outgoing cables. The operating handle is of malleable unbreakable iron, and is mounted outside the housing.

An Automatic Liquid Starter.

A liquid rheostat for the automatic and progressive starting of electric motors has recently been introduced in France by Messrs. R. PLANCHE & CO., of Villefrance-sur-Saone. It consists of a small tank with two compartments, figs. 2 and 3, and in the lower portion of the tank, which contains a solution of water and carbonate of soda, is fitted a rotor with centrifugally-acting blades. The upper part of the tank encloses three electrodes, supported from the cover, electrically insulated one from the other and connected to the motor which requires to be started. The lower ends of the electrodes dip slightly into the solution, the necessary resistance being obtained in this way for the initial stage of the starting operation. At the top of the tank is a short-circuiting device consisting of a metal plate with spring "touches" resting on an insulated rubber diaphragm which also serves as a sealing joint. Below the diaphragm are two small tubes or pipes, one on each side, which serve as a connection between the upper and lower compartments of the tank. When the motor begins to rotate the solution-lifting turbine in the tank is brought into motion by a small round belt drive, and the solution is thus caused to rise into the upper portion of the tank, gradually submerging the electrodes until it reaches the diaphragm, which it lifts, so bringing the short-circuiting device into action. The diameter of the overflow pipes not being sufficient to cope with the total delivery of the turbine, the pressure of the solution on the diaphragm increases, resulting in closer contact of the short-circuiting "touches." When the motor is stopped the solution rapidly falls into the base of the tank, so releasing the short-circuiting contacts. The two parts of the tank are separated by a valve which is kept closed as the solution rises and opens when the liquid returns to the base. The apparatus is capable of ready adjustment. After connecting the terminals to the brushes of the motor it is only necessary to pour in solution through a filler hole up to a level at which the electrode resistance is equal to that necessary for the first phase of the starting operation. The "Planche" liquid rheostat is being made in four sizes suitable for a.c. or d.c. motors of 2 to 12, 12 to 25, 25 to 80, and 80 to 250 h.p., up to 600 V, the power absorbed

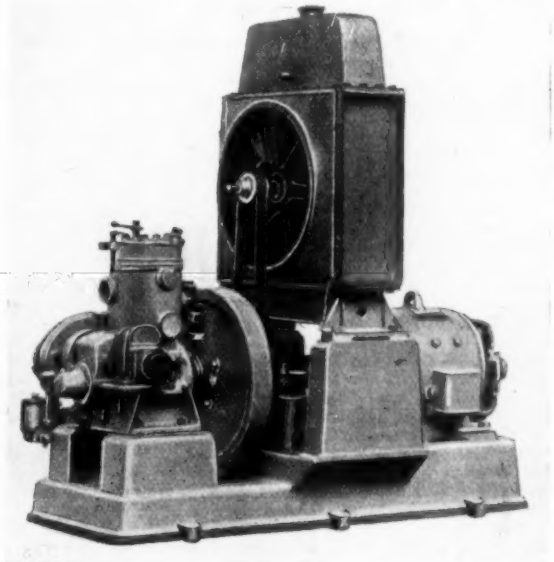


Fig. 4.—Special "Brooke" Generating Set.

in driving the little turbine being only from 0.01 to 0.02 h.p., according to the size.

Small Sets for Tropical Climate.

Messrs. J. W. BROOKE & CO., LTD., Adrian Works, Lowestoft, have recently received an order for a number of 1-kW generating sets for use in the Dutch East Indies. These sets take exactly the same form as the makers' 1-kW yacht lighting equipments, except that they each embody a large fan-cooled radiator, fig. 4, to facilitate the running in the tropical climate. The power unit consists of a 2-h.p., 2-stroke engine with magneto ignition and enclosed governor gear affording a very close ratio of governing.

The Greek Electrical Market.

Prospects for the Sale of British Appliances and Accessories.

A REPORT recently prepared by the Department of Overseas Trade states that in view of the increasing number of electric power stations in the country, Greece promises to become a steadily advancing market for electrical contractors' supplies. At the present time, the bulk of the business is being done by Germany, this being due to three reasons: (1) the attention given to the market by German manufacturers; (2) the comparative cheapness of the goods; and (3) the fact that the Greek safety code regulations issued in July, 1927, are based on the standard regulations in force in Germany.

No general details can be given as to the practice regarding ceiling blocks, lampholders, switches, plugs, and sockets beyond that all such materials must at least conform to the German V.D.E. (Verband Deutscher Elektrotechniker) standards. These regulations stipulate, as one example, a minimum distance of 6 mm. between the live parts of the component, goods in which the distance was only 4.8 mm. having been rejected. Panel boards for internal wiring are usually made of a marble panel mounted flat 6 in. from the wall and fitted with porcelain fuse receptacles and fuses of German V.D.E. standard pattern, together with small knife switches with protecting metal shields. Both Edison screw and bayonet types of lampholders are in use, but mainly the former. As to switches, all kinds—rotary, tumbler, surface, or flush—are employed. For sockets, the material used must be either bakelite or porcelain, while the minimum rating of surface or flush switches should be 6 A at 250 V. There is one electric lamp manufacturing concern in Greece, but its products are now sold at the same price as imported lamps of which those meeting with the largest sale are the "Osram" and "Philips" makes. In addition to that done by German firms a large trade is carried on in fancy glass shades of Czecho-Slovakian make. Apart from a few highly-priced shades and fittings only a limited trade has been done in Greece in electrical contractors' supplies of British manufacture. For power and lighting cable conduit tubing of the Bergmann type internally lined with impregnated paper is chiefly used. For damp and wet places the regulations require the use of steel tubing, which should also be paper lined. Such goods as fuse and switch-fuse boxes and distribution boards such as are used at the junctions of the consumers' systems, including meters, are only obtainable through the power supply undertakings and are not procurable by the public.

While goods imported into Greece must conform to V.D.E. standards, it is not absolutely necessary that they should bear the V.D.E. stamp, although German importers have seen to it that articles bearing the stamp are chiefly in demand. Electrical components not bearing the V.D.E. mark must, however, first be submitted to, and secure the approval of, a department of the Ministry of Communications; the necessity for official approval also extends to meters, and in this case a deposit of a certain sum of money with the Government Department is necessary. The existing regulations are set out in a book written in 1928 by M. Ivannes D. Phlambourearis, entitled "Legislation Regarding Electrical Installations," published in Athens by Dr. Theophilopoulos.

Since a British concern secured a concession for electricity supply in Athens and the Piraeus district of Greece there has been an improving demand for high-class material which at present, by their persistent attention to the market, is being carried off by German firms. It is interesting in this connection to mention that a movement is on foot which, if successful, should assist in extending the market for British goods—*viz.*, that of inducing the Greek Ministry of Communications to adopt a new safety code based on the I.E.E. Regulations for the Electrical Equipment of Buildings. Foreign firms will not hesitate to adapt their goods to any new requirements that may be adopted, and British makers should lose no time in introducing their goods to the Greek market.

A small but growing trade in contractors' supplies is being done in the two Greek provinces of Macedonia and Thrace. The imports amount, at present, to about £40,000 per annum, of which fully 85 per cent. comes from Germany. One German company maintains its own direct branch; another is represented by purchasing agents, whilst two others do their business through local agents on a commission basis. In this district, the usual rate of commission to purchasing and commission agents is 3 per cent. on electric wires, cables, and tubing, and 5 per cent. on all other articles. In addition to a well-known German firm, the Dutch Philips Company has direct representatives, to whom large stocks are consigned, and who, wherever possible, make direct sales and also distribute material among the chief electrical stores for sale on their account. There are several smaller agents in the country who sell on commission but the volume of trade done in this way is not large. No British goods appear to be sold in these provinces, although Austrian and Hungarian makers are selling lamps, Holland electric wires and lamps, Italy wires and cables, France meters, wires, and lamps, Czecho-Slovakia shades and fittings, and Switzerland electricity meters.

The power supply in the Salonica district is in the hands of a Belgian company which, with the view of meeting the increased demand, has recently secured a concession to establish a hydro-electric station to utilise the power of the Tripotamus Falls and to supply electricity not only to Salonica but also to Verroea and to most of the towns and settlements in the Axios Valley.

Although Germany was the principal supplier of motors and dynamos in 1929, its share being valued at 13,857,660 drachmae, against Great Britain's 3,946,325 drachmae, in the supply of electrical instruments and apparatus Great Britain held first place, with a share of 17,382,620 drachmae, against Germany's 17,194,048 drachmae. The current value of the Greek drachma is 375 to the £. Any British firm contemplating an attack on the Greek market should, in the first place, send out representatives to make a careful study of conditions on the spot and to appoint agents of good standing and with the necessary technical knowledge. Generally speaking, it will be necessary to make some provision for publicity expenses and to arrange for stocks of goods to be always on hand at competitive prices. It is advisable, too, that any catalogues, booklets, &c., should be printed preferably in Greek or, alternatively, in French.

The Domestic Appliance Market.

Considering Greece as a market for domestic electrical appliances, so far little business has been done; what sales have been made having been limited to well-to-do residents who could afford such a "luxury," for hitherto the cost of electricity has been somewhat high. There are, however, indications of wider trading opportunities for not only is the Société Hellenique de Production establishing a new station and distribution network for the supply of energy in the Athens-Piraeus districts which will render it available to a population of about a million people, but it is introducing a lower scale of charges for domestic supplies. The supply is 221/380 V, 50-cycle, a.c., and the present charge is 8.50 drachmae per kWh for lighting and 3.50 drachmae per kWh for domestic purposes. As much as 15 drachmae per kWh is charged by other companies. The company hopes by next winter to be able to reduce the rate for domestic purposes to less than 3 drachmae per kWh in order to enable electricity to compete with gas and charcoal for cooking purposes. Two-rate meters, already ordered from Great Britain, are to be used, and it is reported that power supplies at the lower rate will be available between 7 a.m. and 7 p.m., with a condition of a minimum annual consumption of 600 kWh.

At the present time there are some 35,000 consumers of electricity in the Athens-Piraeus area, and the number is expected to increase to about 60,000 within the next two or three years. From this the deduction is made that during the period mentioned it may be safely assumed the numbers of users of domestic electrical appliances will show an increase of from 20,000 to 25,000 and that, assuming an average expenditure on such articles of £5 per consumer, there is a possible market within the period mentioned of from £100,000 to £150,000 worth of goods.

Domestic electrical appliances are not being manufactured in Greece, so that what goods are being sold are all imported. Two well-known German concerns and a French company control the major portion of the business, although there is one British firm which is devoting special attention to the Greek market and promises to become a serious rival to the German manufacturers. In addition to these, there are a number of small representatives and agents of Hungarian, Swiss, Italian, Czecho-Slovakian, and American makers. Except that the last have a strong hold on the trade in refrigerators and vacuum cleaners, the volume of sales done is not at present large. As in the case of contractors' supplies, the report agrees that while the market may be a small one at the first it is one that, appropriately handled, may be expected to grow. It is shown, however, that the handling must comprise the sending out of "live" representatives, liberal credit terms and other facilities for agents, competitive prices, a publicity campaign, and the maintenance of showrooms with ample stocks.

What is regarded as the most successful sales method adopted in Greece is that of the German A.E.G., which has its own branch depôt in Athens with a competent German and Greek technical staff. Not only has it appointed agents in all the chief towns of Greece, such as Salonica and Patras, but it also undertakes all kinds of electrical and wiring installations. Large stocks are maintained at the showroom where sales over the counter are made. In addition to this, the firm has a staff of representatives who travel the country with cata-

logues and samples with which demonstrations are given. No stone is left unturned to satisfy a likely customer, no matter how small or insignificant the prospective order may be.

Inquiries show that radiators, "cooking pans," fans, and irons are the chief domestic electrical appliances at present in demand in Greece. Lately, as the result of the activities of a German concern, there has been an increasing sale of vacuum cleaners.

While there is thus a fairly good prospect for trade in domestic appliances in Athens and Piraeus, the business is likely to be very largely confined to that part of Greece, there being little prospect of any important demand in the provinces, except, perhaps, for electric fans, which even then would, in the majority of cases, be purchased through agents in Athens. As little business is done elsewhere goods should be consigned c.i.f. to Piraeus. The credit and terms of payment offered to agents and dealers range from three to four months, interest at the rate of 8 per cent. being charged for any longer periods. Where agents are employed, their usual commission is 5 per cent., while the dealers receive a discount upon the retail price of from 20 to 30 per cent., according to the class of article.

It must be remembered that Greece is a "cheap" market, goods being purchased more for the present than for the future. Lasting quality, while admired, is not a good selling point if it adds appreciably to the price. At the moment, trade in Greece, as in most countries, is not in a flourishing condition, but it is to be trusted that this is only of a temporary nature. Although catalogues are always useful in the Greek market, there is nothing so good as showrooms in which prospective customers can inspect the articles for themselves and see them demonstrated.

The Price-Volume Study.

An Explanation of the Application of a Practical System for Fixing Selling Prices to Yield Maximum Net Returns.

By A. W. WILLSMORE, F.R.Econ.S.

I HAVE already referred briefly in a previous article* to the use of price-volume studies as a basis for the determination of selling prices, but I feel that the subject is of sufficient importance to justify a further article on the practical application of the system. The basis of the scheme is to determine the elasticity of demand for each of a company's main groups of products with a view to fixing the selling prices at a figure to give the maximum possible net return over manufacturing expenses. In practice the system is not quite so simple to apply as it seems at first sight, but there are no insurmountable difficulties, and when a company is basing its prices on such a system it can be confident that it is making the best of existing market conditions.

The first step in the preparation of a price-volume study is a general consideration of the company's sales possibilities for the year under review. Many companies make such a review at regular intervals as part of their budget system, with very valuable results, quite apart from any connection with the establishment of prices. The first step in such a review is the consideration of general trade conditions in all of the territories in which the company is interested, with particular reference to the conditions in any industries which are particularly good customers of the company. For instance, a firm manufacturing magnetos and similar products would give special attention to conditions in the motor industry in addition to the position of general trade. The result of such a study would be to provide the company with a very good idea of the market potentialities for its products during the year under review. For example, if the examination showed that general business activity would probably be at a lower level in the year under review than in the previous period, the company would know that the normal tendency would be for its sales to fall off, and that with the same selling prices, a smaller volume of business would probably be received in the future than in the past.

The company must also take into account the question of technical modifications, as these are liable to have an important bearing on demand, and also the development of new products likely to affect the sales of old-established lines. Consideration must also be given to the general activities of competitors during the coming year.

Attention must also be paid to the company's probable financial position over the period, to determine what effect changes in the concern's resources are likely to have on the volume of business that it will be able to finance. Finally the matter of production capabilities must be considered, particularly in the direction of determining the availability of spare equipment. This should show what changes are needed in the sales programme to keep previously idle machinery active. It should also show in what directions the producing plant is already taxed to its maximum capacity and where extra business cannot therefore be taken without providing additional equipment.

Having completed such a general review of market, capital, and production probabilities, the company is in a position to put in hand the price-volume system with a view to determining the prices that it shall charge for its various products in the coming year. In actual practice this involves the listing in parallel columns, for each of the main products, the sales that may be anticipated with various modifications over and under the previously ruling prices. These quantity sales figures must then be converted to values, and against these sales values must be set the cost of producing the volume of goods implied. The actual steps in the procedure will probably be more clearly grasped from the consideration of a hypothetical case.

Assume, for example, that a company is selling an electric vacuum cleaner at a price of £12 10s. (allowing for trade discounts), and that the prime cost of the machine is £8. Considering the probable trade conditions during the year under review, the company might expect to sell, say, 1,100 machines at the price of £12 10s. The problem is to decide what sales can be expected at various reductions and increases over that figure. If the price was reduced to, say, £11 10s., sales would naturally be increased. It must be remembered, however, that if the company reduces its prices, its competitors will probably follow suit. Allowance must be made for such factors and a schedule prepared similar to that shown in the accompanying table. It will be seen from this table that the optimum price, *i.e.*, the price at which the balance over cost is largest, is £11, representing a reduction of £1 10s. over the previous price. At this price sales are expected to amount to 1,700 machines during the year.

Product: Model XYZ vacuum cleaner.
Present Selling Price: £12 10s.
Cost Price: £8.

Proposed selling price.	Expected sales.	Value of sales.	Prime cost of sales.	Balance over cost.
£12 10s.	1,100	£13,750	£8,800	£4,950
£12 0s.	1,200	£14,400	£9,600	£4,800
£11 10s.	1,400	£16,100	£11,200	£4,900
£11 0s.	1,700	£18,700	£13,600	£5,100
£10 10s.	2,000	£21,000	£16,000	£5,000
£10 0s.	2,200	£22,000	£17,600	£4,400
£13 0s.	1,000	£13,000	£8,000	£5,000
£13 10s.	800	£10,800	£6,400	£4,400

This estimate of sales would, of course, have been made by responsible officials in the Sales Department, who would be guided by figures of the potential market as indicated by the number of houses wired for electricity supply, &c. Allowance would also be made for the activities of competitors, and for the advantages and disadvantages of the individual company's machine as compared with the machines offered by competitors.

Many firms have the mistaken notion that the higher their output the more profitable is their business. This is not always the case, and the advisability of increasing sales can only be decided on the basis of the price concessions needed to secure the added volume of business. In fact, it will sometimes be found that it would pay a company better to increase its selling price slightly at the expense of reducing its volume of sales. For instance, the assumed figures in our schedule show that in this particular case a larger gross income would be secured on a basis of sales of 1,000 machines at a price of £13 each than on a basis of sales of 2,000 machines at a price of £10 each. Such facts as these can only be established from the preparation of a price-volume study.

A point that must not be lost sight of, however, is the possible effect on costs of increases or decreases in the volume of business. In the above analysis, the assumption has been made that the prime cost of the machine remains at £8 whether the output is 800 or 2,200 a year. In actual fact, of course, this would not be the case, but the individual manufacturer should have a sufficiently good idea of his manufacturing position to be able to make the necessary allowances

* "Fixing Selling Prices," ELEC. REV., January 9th, p. 54.

for this element. In a similar way, no provision has been made for any possible increases in overhead charges, but here again such changes can be forecast with reasonable accuracy. In certain instances it may be found that these two factors offset one another. For instance, in the case we have chosen as an example, the increase in volume of business from 1,100 to 1,700 might involve an increase of, say, £800 in overhead expenses. This would, of course, have to be offset against the gross income of £5,100 to make comparisons between the figures justifiable. At the same time, however, the increased volume of output might enable the shop cost of the machine to be reduced by, say, 10s. from £8 to £7 10s., which would reduce the cost of the total output by £750, thus accounting for practically the whole of the increase in overhead charges.

It may be argued that with so many factors to be taken into consideration no really reliable results can be expected, especially as the accurate determination of several of the factors is not possible. In actual fact, the price-volume study method has been proved in practice to be of the greatest possible assistance in enabling prices to be fixed on a scientific basis. For a firm that is using the system for the first time, however, it may be found wise to make arrangements for frequent revisions of the study at regular intervals, until a sufficiently good grasp of the ruling conditions has been obtained to make this step unnecessary.

Cable Technique.

Comments on modern theory and practice with regard to breakdowns, rating, and the testing of cables.

By P. DUNSHEATH, O.B.E., M.A., M.I.E.E.

(*Extracts from a paper read before the* ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.)

THE position to-day with regard to modern high-class cable manufacture is that the thicknesses of dielectric laid down in B.S.S. 7 could be extensively revised without in any way impairing the safety or reliability of the undertakings on which they are employed. The dielectric breakdown strength of impregnated paper as used in high-voltage cables is of the order of 200 to 400 kV per centimetre, but this value is limited by imperfection in the materials and construction, rather than by the physical limits of the materials themselves. To produce pure dielectric breakdown that is solely due to electric stress on the material itself, it is necessary to apply such a stress as will tear electrons out of the atoms of the material, and this requires a field strength of millions of volts per centimetre. An important theory assumes that in a liquid dielectric the movement of an ion at high speed vaporises the substance, and the resulting gaseous track is immediately broken down by true ionisation under stress.

The basis of all current ratings for cables has been accepted as the temperature to which the dielectric may be subjected, but the view to-day is that to define the absolute maximum temperature is not sufficient. The range of working temperature is also important. The procedure to be followed in calculating the currents which may be safely carried without exceeding the temperature limits laid down has now been fairly completely developed. In the first place, the resistance opposed by the cable and its surroundings to the escape of the heat generated must be calculated, and the path usually consists of a number of components, each with its own specific properties.

The unit of thermal resistance has been given the name "thermal ohm" for convenience, and is the opposition to the flow of heat which is offered when a temperature difference of 1 deg. C. is required to produce a flow of 1 watt of heat energy. By continuing the analogy with the electrical circuit we get the definition of thermal resistivity of a substance; it is the thermal resistance between opposite faces of a centimetre cube of the material when one watt of energy is made to flow through the cube by the application of a difference of temperature of 1 deg. C. between two opposite faces. Values of thermal resistivity in common use for the more frequently-employed substances are: l.p. impregnated paper dielectric, 750 deg. C. per watt per cu. cm.; h.p. impregnated paper dielectric, 550 deg. C.; armouring (including metal serving), 300 deg. C.; normal soil, 180 deg. C.

In addition to the copper losses, which constitute the most usual heating effect in a cable, the adoption of higher voltages has resulted in dielectric loss becoming an important factor in current rating. At low voltages the effect of dielectric loss is negligible, but at the higher voltages, particularly at times of low load, the proportion of dielectric to copper loss may be appreciable. With a 66-kV cable working at half load the ratio of dielectric to copper loss may approach as high a value as 50 per cent. It is only the full-load ratio, of course, which affects the current rating, but even here the increase amounts to 10 per cent. on the conductor loss. The reduction of current-carrying capacity by sheath losses on a 66-kV system in Chicago costing £12,000 per mile installed was so great that partial elimination of the losses on the lines already indicated effected a saving equivalent to a capital cost of over £2,000 per mile.

It may be said that three different tests are at the present time competing for the honours of providing a true indication of the quality of an e.h.p. cable and the order of its reliability in service, *viz.*, breakdown test, ionisation test, and stability test. The breakdown test to be of any value as an indication of the probable life of a cable must be made a time test. Further, no matter how useful the results obtained, the breakdown test can only be a type test; it can form no solution in the evolution of an acceptance test for cable which is to be taken into service afterwards. The ionisation test consists in measuring the change of power factor of a cable with increased voltage. It is known that the presence of voids or other weaknesses in the dielectric results in a rise in the ionisation test curve, the power factor at twice working voltage being considerably higher than that at working voltage. Although so far not definitely established, it seems very probable that there is a close connection between the ionisation and breakdown characteristics of the cable. We may expect that, if the ionisation curve shows the power factor to be rising with the voltage, there are deteriorating influences at work which would cause the time-voltage breakdown curve to fall away more rapidly with time, and give a lower final value than it would if ionisation were absent. The ionisation test possesses the very great advantage that it can be applied to every length of cable manufactured and delivered to the job, without introducing any risk of failure in service.

The third type of test, the stability test, is really an extension of the power factor-voltage test. It consists primarily in measuring the change of power factor brought about by the application of one or more heating cycles. It may also quite conveniently include the comparison of ionisation before and after loading cycles, and it may be carried out on the lengths of cable on the drum, laid in the ground, or actually buried to simulate practical conditions. The test may also be carried out with or without voltage applied during the heating and cooling cycles. Whether or not a length of cable should be used on a contract after being subjected to a stability test is at present a matter of opinion, but it is not difficult to see that there may be grave objections in the case of lengths of cable for the very-high voltages.

The Electric House.

The responsibilities of the supply undertaking, the installation contractor, and the manufacturer.

(*Report of a debate of the* LONDON STUDENTS' SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE full title of the subject debated on February 20th was "Are the Present Methods of Supply of Current and Apparatus Conducive to the Spread of Domestic Electrification?"

Mr. W. F. J. Walton, who opened, played the rôle of "devil's advocate," describing himself as an ordinary consumer with electrical knowledge. He thought that where tariffs were reasonable and the rate of progress slow, there must be something wrong with either the methods of salesmanship or with the design of apparatus. Detailing his efforts during the last five years to possess an all-electric house, he told how, in the first case, after some trouble, he persuaded the supply authority to allow him to do everything electrically. On the next occasion, however, twelve months ago, he moved to another area, where the undertaking restricted his demand to 4 kW, thus ruling out cooking. Summarising his experiences, Mr. Walton said that the advantages to be enjoyed from an electric house were certainly very considerable, but one needed to have sufficient enthusiasm to overcome the evident reluctance of some supply undertakings to connect up domestic load, while adjustments to apparatus and flexibles had occupied much more of his time than should have been necessary. Among Mr. Walton's suggestions for accelerating development were the letting out of apparatus on free trial, demonstrations in the home by technical salesmen, the extension of the powers of the C.E.B. to enable it to provide loans for distribution extensions, and the contribution by the supply authority of part of the cost of wiring (the authority seeking the co-operation of builders to ensure that enough points were installed). In regard to apparatus, the usual causes for dissatisfaction fell under four heads: (1) radiators with too-small loadings; (2) flexible leads too fragile; (3) ignoring of the possibilities of thermostatic control, *e.g.*, in irons; and (4) the slowness of boiling rings. Another point was that cheap foreign apparatus was sold in stores for "connection to the lighting circuit." Considerable research should be devoted to improving domestic apparatus. There was as

far as he could ascertain only one B.E.S.A. specification for such apparatus in existence dated 1920. Attention should also be paid to the extension of off-peak tariffs for residence heating.

Mr. V. S. Lake laid it down that all action was prompted by inducements, and that the inducements to use or increase the use of electricity were economy and convenience; the former should not be confused with a mere saving of money. The success of an undertaking was bound up with the service it gave. He commended the use of demonstration houses by supply undertakings, but said that as it was not always possible to bring the public to the house, it would be necessary, particularly in rural areas, to bring the house to the public, as his own company had done with its caravans. His remarks were illustrated by a series of lantern slides. He pointed out some of the difficulties of supply undertakings in meeting the demands of consumers, and claimed that there had been a distinct improvement in their methods in recent years. It was impossible to develop large areas without considerable capital resources.

Mr. H. T. Young, in the chair, said that to give everything free of cost was a council of defeat. The consumer must be shown that electricity was worth using; bad work was the fault of the consumer who would not pay for good value. In no country was so much done for him; in the U.S.A. the undertakings had persuaded their consumers to use electricity on a large scale and sold them apparatus on hire-purchase; they did nothing beyond the house-service terminals.

During the subsequent discussion the following members spoke: Messrs. F. Jervis Smith, W. G. Jones, Pearson, C. E. Hollingsworth, C. P. Garside, Thomas, Hart, Farjeon, Argent, Ratcliffe, Rouston, Stillman, Williams, G. H. Lockett, and L. J. Crutch.

It was said that sales of small electrical apparatus had increased by 18 per cent. last year, and that their reliability was such that many undertakings were able to offer a year's free maintenance. The capital value of small mains laid 25 years ago to deal with lighting loads should by now have been written off, thus giving no excuse for inadequacy of distributors to meet the domestic load. In reply to some speakers who emphasised the importance of high-load-factor apparatus, it was suggested that peaks were a bogey, and should be met by plant (*e.g.*, internal-combustion engines) in the power stations. That low rates for electricity alone were of little use in developing the domestic load was stressed by one speaker who lived in an area where rates were among the lowest in the country, but who had been driven to use gas as he could obtain no attention whatever to his requests for information from the supply authority.

Canadian Hydro-electric Development.

Progress during 1930.

IN a review prepared by the Dominion Water Power and Hydrometric Bureau of the Department of the Interior on the development of water power in Canada, it is stated that new installations brought into operation during 1930 aggregated 397,850 h.p., bringing the total installation for the whole Dominion up to 6,125,000 h.p. Construction is also in progress of a number of undertakings throughout the country, and with the completion of these during the next two or three years more than 1,500,000 h.p. will be added to the Dominion's total. This large programme of construction has involved an expenditure of $80,000,000 during the past year, and as much as $300,000,000 will be required for development schemes during the next few years. It is estimated that more than 11,000 men are at present employed on the actual construction of these various developments.

Hydro-electric construction activities were particularly active in British Columbia throughout 1930, resulting in the addition of 71,000 h.p. to the province's total. In addition, other projects were in progress involving initial installations totalling over 136,000 h.p. The British Columbia Power Corporation through a subsidiary, the Western Power Company of Canada, Limited, brought into operation a new plant and station at Ruskin on the Stave river with the first generating unit of 47,000 h.p.; the ultimate capacity of this plant will be 188,000 h.p. Good progress was also made with the undertaking of the Bridge River Power Co., Ltd., on the Bridge river, and it is expected that the initial installation of 56,000 h.p. will be ready for operation in 1932. This development is designed to be extended by stages to an ultimate capacity of 600,000 h.p.

During the late summer, the West Kootenay Power and Light Company commenced construction of its fourth development on the Kootenay river. This will be known as the Corra Linn plant and will comprise three 19,000-h.p. units. The same company is making plans for two other developments, one on the Pend d'Oreille river (350,000 h.p.) and the other on the Adams river (30,000 h.p.).

The year 1930 was notable in Saskatchewan as it marked the completion of the first hydro-electric development in the province, the Churchill River Power Company bringing into operation its 42,000-h.p. installation at Island Falls on the Churchill river. This station is designed for an ultimate capacity of 84,000 h.p.

In Manitoba the North-Western Power Company has a development in hand at the Seven Sisters site which will ultimately comprise an installation of six units of 37,500 h.p. each. At Slave Falls the City of Winnipeg is engaged in constructing a development which will have ultimately eight 12,000-h.p. units. A transmission line 86 miles in length is being constructed to carry the power to Winnipeg. The Manitoba Power Commission extended its transmission lines during the year to the extent of 319 miles.

In Ontario 136,000 h.p. was added, while other undertakings under way involve installations aggregating 442,000 h.p. The Hydro-Electric Power Commission of Ontario completed and brought into operation unit number ten of 58,000 h.p. in its Queenston plant on the Niagara river. The Commission also completed its second development on the Nipigon river and the Alexander development. At Chats Falls on the Ottawa river a joint development is being carried out by the Commission and the Ottawa Power Company, which will have an initial installation of 224,000 h.p. A 220,000-V transmission line is now under construction which will carry the power 200 miles to Toronto, where it will be connected up with the Commission's Niagara system.

In Northern Ontario, the Ontario Power Service Corporation, Limited, has commenced the development of the Canyon site on the lower Abitibi river, where 330,000 h.p. will be installed.

In Quebec, new water power installations actually placed in operation during 1930 totalled 123,000 h.p., while there are developments of outstanding importance under active construction involving an initial installation of 805,000 h.p. and a final installed capacity of 2,013,000 h.p. The plants under construction are practically all of large capacity and include the Beauharnois on the St. Lawrence (500,000 h.p.), the Rapide Blanc on the St. Maurice (240,000 h.p.), the Chute-à-Caron on the Saguenay (260,000 h.p.), and the Chats Falls on the Ottawa (224,000 h.p.).

In New Brunswick the St. John River Power Company addded the fourth unit of 20,000 h.p. to its hydro-electric development at Grand Falls on the St. John river and this plant is now completely installed with a total capacity of 80,000 h.p.

Electrically-welded Ships.

Results of Constructional Experiments in Germany.

By G. WAHL.*

(*Extracts from a paper read before the* INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.)

ELECTRIC arc welding has been developed and improved so much since 1918 that it can now be applied practically and with promising results to the construction of ships. In 1926 the Deutsche Werke resolved to introduce this method into their workshops with the aim of adopting it in ship construction. In order to study fundamental requirements, exhaustive investigations with test pieces were first undertaken in the laboratory and soon led to the conviction that the advantages of electric welding could not be attained by the methods previously practised by shipbuilders. It was, therefore, decided to build a 52-ft. launch for trial purposes which might at the same time serve for training welders. The tests led to the following conclusions:—

(1) Taking into consideration that welds at right angles to the exerted strain resist a tensile stress of at least 100 per cent. of the stress acting upon the full plate section, the butts of shell plating may be placed in the one plane, provided that ample welding material is applied to the welded butt.

(2) Longitudinal welding, that is, in the direction of the tensile stresses, ought to be avoided in all parts exposed to excessive stress, but is admissible to parts exposed to minor stresses; with such parts acting as lower or top flanges of girders, where continuous longitudinal seams cannot be avoided, normal riveting must still be retained in the present stage of electric welding.

The above two conclusions are exceedingly important and fundamental. The ship was propelled by a four-cylinder benzine engine of 100 b.h.p. at 1,000 r.p.m.; it was surprising to see how quietly it worked in service, and there was almost no vibration at the ends of the vessel, either at full speed (11 knots) or when the propeller was disconnected. It appears to be certain that a firmer connection of all parts is accomplished, and that a more rigid structure is produced by welding than is possible by riveting. So far as the engine foundation is concerned, the reason for this result must be attributed to the avoidance of all angle connections, which would have had an "accordion" effect. After a year's service, the boat was again submitted to a close examination, and it may be safely said that the desired results have been obtained by the methods adopted, and that the vessel is a practical success.

* Translated from German by Mr. H. E. Jones and read by Mr. Adams.

The distribution of butts and seams varies from the normal arrangement; instead of the plating being arranged with continuous seams and shifted butts, the butts are in line and the seams stepped. A shift of seams of 6 in. was considered to be sufficient. Riveting was only adopted at the girder flanges, that is, at the top between the deck and sheerstrake, and below at the keel and stem. All single parts to be welded must be prepared most carefully, particularly plates used for smooth surfaces must be rolled quite fair and hammered exactly to the required shape.

A critical comparison shows that the welded boat has the advantage of less weight, because the angle flanges and overlaps are saved; this reduces the cost, but greater expense for wages is incurred by the necessity of preparing the plates properly, as well as by the process of welding itself. Too great precaution was taken with some of the details, and future work might be simplified, but, nevertheless, the saving of material is too small to compensate for the increased amount of wages. Soon afterwards two oil-tank lighters of 600 and 1,000 tons capacity were built in a similar manner. Horizontal welding is quicker and more reliable, so that as much as possible was completed before erection. The plates were first attached to one another by small tack welds (4.72 in. apart) and then the main welding was commenced at the middle of the butt of the middle plate, working towards the ends. The occurrence of strains is indicated by the tack welds tearing apart. It is necessary not to rivet up any continuous seams until all welding in the vicinity has been finished, otherwise the rivets will become slack due to shrinkage.

Comparing two vessels of the same principal dimensions (40.6 m. by 8.2 m. by 4.85 m.) the weight of the welded ship is 70 per cent. of that of the riveted boat; the carrying capacity of the riveted load is 64 tons less, and it follows that the deadweight carrying capacity of the welded ship is 11.5 per cent. greater. The welded ship has, therefore, an advantage of 7.4 per cent. in relation to displacement. The comparison of two ships of the same deadweight carrying capacity leads to a similar result. The experience gained in building the launch was confirmed, namely, that it is more expensive to weld than to rivet 1 ton of shipbuilding material; but the total cost, in the case of the oil lighter, is more in favour of the welded vessel, because the advantages of the welding process are more obvious with the larger boat having a greater weight. Considering the prices of ships of the same size, it has been ascertained that 1 ton of shipbuilding material is 29 per cent. more expensive in a welded than a riveted ship; but 1 ton of deadweight carrying capacity of the welded vessel is 11 per cent. cheaper than 1 ton of carrying capacity of the riveted ship. The working hours spent on building ships of the same size are approximately the same, due to the fact that, although the time spent on punching, countersinking, and rimering rivet holes is saved with the welded vessel, it is lost by the lower rate of welding; in addition the wages of welders are higher than those of riveters. The two lighters have now been in service for 2 and 1½ years, respectively, and there are no indications of even the smallest defects in the welding in that time; the system must be considered to have been a complete success.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Electrolysis and Rubber.

I have pleasure in appending a further analysis of the cable electrolysis referred to in your issues of January 30th and February 20th.

1. "Sulphur in the form of sulphates was not present in bulk at or near the break in the cable. It is difficult to see how such sulphates could be produced together with sodium, as this would imply an electrolyte containing sodium sulphate. Any sulphuric acid set free would appear at the positive pole and then give rise to secondary reactions with either the positive electrode or the wall in question. Such a transference as mentioned seems unlikely. A similar case to the one in question involved a leak of d.c. across some wet mica. At the negative end quantities of caustic potash (from the mica) were formed, but little or no action was observed at the positive end."

2. "Concerning the rubber itself, it would seem that the production of carbonates and hydrogen is not feasible. At the negative pole the atmosphere would be a reducing one in any case. Heat due to passage of current and/or secondary reactions would, of course, destroy the rubber as such, but there would be insufficient oxidation to produce CO_2 in any large amount. Neither, according to this argument, would sulphur, either from 'fillers' or vulcanised rubber, be oxidised to sulphuric acid. The production of hydrogen from the rubber by decomposition is not feasible. Furthermore, in the absence of strong oxidation the 'fillers' would not be released from the tarry masses of rubber sufficiently for extraction with aqueous acids, and so would not show up in a qualitative test, such as that used in investigating the matter adhering to the cable."

This bears out the suggestions made by the St. Helens' Cable Co. that the rubber was reduced by heating action only. On the other hand the fact that the action commenced in several places, in each case under the metal clips securing the cable to the wall, seems to negative the suggestion of initial damage to the cable.

The most probable cause of the failure was the prolonged contact of the insulation with alkaline solution (for five years) together with pressure or constriction at the securing clips, which would eventually give rise to cracks in the rubber compound.

W. Jones,
TEESDALE & JONES.

Swindon, *February 23rd*, 1931.

Church Lighting.

In your issue of the 13th instant Mr. D. Spencer Johns writes at some length on the above subject. Although the article deals chiefly with illumination, the last paragraph mentions various systems of wiring, and gives the place of honour to the screwed-conduit system.

Having had considerable experience of church installation work, may I draw your readers' attention to the following points:—

(1) It is acknowledged that screwed conduit gives the best mechanical protection for electric cables, but it is undesirable that conduit installations should be installed in church buildings, other than churches now being built, owing to the difficulties of concealing the conduit from sight, particularly in the case of tee boxes and right-angle bends, and also on account of condensation difficulties.

(2) From the context of the original article it would appear that, while tough-rubber-sheathed cables are sanctioned by the fire offices, metal-sheathed cables are not sanctioned. This, of course, is incorrect.

(3) Metal-sheathed cables can be installed with perfect safety in contact with limestone, provided the necessary earthing and bonding are efficiently carried out.

(4) The statements that metal-sheathed cables should not be installed where subjected to the depredations of rats, or where liable to mechanical damage, apply with equal force to tough-rubber-sheathed cables.

I feel certain that anyone desiring information on church lighting and reading Mr. Johns' article will be decidedly prejudiced against metal-sheathed cables, but most diocesan architects and surveyors are exclusively specifying a metal-sheathed wiring system for electrical installations in mediæval churches, and I therefore assume that, having compared the various systems for this purpose, they have chosen the metal-sheathed system as being the most suitable for church-lighting purposes.

D. G. Denoon.

Mill Hill, N.W.7,
February 23rd, 1931.

How to Cheapen Electricity.

I have great pleasure in congratulating you on your very excellent and explanatory leader in this morning's issue, under the heading "How to Cheapen Supply," with all of which I cordially agree. It is quite extraordinary how difficult it is to explain to the average man in the street how much electricity supply depends on the density of demand.

R. E. Crompton.

London, *February 20th*, 1931.

[Col. Crompton's support of the views expressed by us is a matter of public interest. We might add that some engineers as well as "the man in the street" do not appreciate the importance of this point.—EDS. ELEC. REV.]

Wages in the Electrical Contracting Industry.

I do protest against the statement by "Hadsum" that the present agreement is a "wangle to keep up prices"; he cannot be aware of the constitution of the N.J.I.C. I have before me the minutes of the meeting held on November 6th last, and they run into eleven foolscap typewritten pages.

Representing the N.F.E.A., I noticed electrical contractors from as far afield as Belfast, Bristol, Liverpool, London, Bir

mingham and Newcastle-on-Tyne, and to suggest that these gentlemen leave their business for two, three or four days, travel to London, and agree to a "wangle" is, to say the least, lacking in appreciation of the work they voluntarily do on our behalf.

In concluding this correspondence may I inform "Hadsum" that the N.F.E.A. did not give notice to terminate the old agreement, and that the E.T.U. did not get all that it asked for in the new one.

Ex-Councillor E.C.A.

February 21st, 1931.

Technical Pocket Books.

Probably everybody has had occasion to search pocket books for a piece of simple information, but without success. I have recently been trying in a well-known and expensive electrical pocket book to find out the relation between the heating power of a kWh and a gas therm, but there was nothing in the book dealing with this everyday problem. Neither was there any information as to the number of kWh required to boil a gallon of water. Some of our pocket books give the information in the shape of a long formula which must be evaluated, but this is not of much use.

The pocket book referred to gives an account of the B.T.H. mercury meter which has been out of existence for, I suppose, a dozen years. The whole problem of pocket books is a difficult one, but it would be advantageous if the compilers would do all they could to give information in a practical form. Doubtless many other readers could give similar experiences in their dealings with these useful office appliances. A correspondence on the subject would be interesting.

C. Turnbull.

North Shields, *February 21st*, 1931.

Employment Agencies.

I should be interested to have the opinions of your correspondents on the question of obtaining employment as an electrical engineer, through the firms advertising "employment abroad." My position is very similar to that of "Despair" and "Optimistic."

Curious.

February 21st, 1931.

[We invite correspondents to send us particulars of experiences—favourable and unfavourable.—EDS. ELEC. REV.]

City and Guilds Examinations.

In your last issue you published a letter from Mr. W. T. Taylor which implies that my letter of the previous week favoured a lowering of the standard of the "Installation Examination." This is not the case. I tried to make it absolutely clear that I approve of the syllabus and the papers as set last year. My letter was written with this aim, and to put my opinion against a possible changing of the next paper.

The paper should be a test of wireman's work, and not a modified examination in electrical engineering.

F. Peake Sexton.

Kingston-on-Thames, *February 23rd*, 1931.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929.

22,469. "Synchronising of synchronous dynamo-electric machines." Siemens Schuckertwerke Akt. Ges. August 2nd, 1928. (316,669.)

26,017. "Wireless loud-speakers." D. H. Harrington. August 27th, 1929. (342,249.)

29,707. "Continuously loaded electric conductors." Electrical Research Products, Inc June 8th, 1929. (342,322.)

31,293. "Electric totalisators." Automatic Telephone Manufacturing Co., Ltd., L. M. Simpson, R. Taylor, F. T. Belas, and J. W. McClew. October 15th, 1929. (Cognate applications 33,012/29, 34,039/29, and 34,701/29.) (342,261).

31,588. "Control of unilateral electric current-consuming devices." British Thomson-Houston Co., Ltd. October 22nd, 1928. (342,263.)

31,817. "Electrically insulating tubing." International General Electric Co., Inc. October 19th, 1928. (342,280.)

32,224. "Electrically-driven automobile vehicles." Tatra-werke Automobil- und Waggonbau Akt. Ges. January 11th, 1929. (Addition to 340,348.) (342,327).

32,369. "Thermionic amplifier apparatus for use in the reproduction of sound." H. J. Kuchenmeister. October 24th, 1929. (342,255.)

32,516. "Loaded submarine cables." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). October 25th, 1929. (342,331.)

32,680. "Power-converting apparatus." British Thomson-Houston Co., Ltd. October 27th, 1928. (342,336.)

32,681. "Electric heating-units." Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. October 28th, 1929. (342,300.)

32,721. "Electrical testing apparatus." T. W. Corbin. October 28th, 1929. (342,274.)

32,742. "Electric totalisators." Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. October 28th, 1929. (342,276.)

32,865. "Electric torches and the like." A. H. Sheppard and Ever-Ready Co. (Great Britain), Ltd. October 29th, 1929. (342,342.)

32,966. "High-frequency signalling systems." Standard Telephones and Cables, Ltd. December 21st, 1928. (Addition to 287,972.) (342,305.)

32,967. "Damping arrangements for acoustic devices, particularly applicable for telephone transmitters or the like." Standard Telephones and Cables, Ltd., J. G. Flint, and D. G. McKie. October 30th, 1929. (342,306.)

32,968. "Electrical networks." Standard Telephones and Cables, Ltd., and A. T. Starr. October 30th, 1929. (342,307.)

33,011. "Electric remote-control systems." Associated Telephone and Telegraph Co. November 1st, 1928. (342,310.)

33,028. "Synchronous recording of sound and scenes." Electrical Research Products, Inc., and C. E. White. October 30th, 1929. (342,345.)

33,186. "Electric motor driving arrangements for record carriers of gramophones and the like." Electrical Research Products, Inc. December 31st, 1928. (342,347.)

33,307. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., A. H. Williams, and F. A. S. Scarlett. November 1st, 1929. (342,351.)

33,312. "Coupling devices suitable for use with microphones." G. M. Wright and N. M. Rust. November 1st, 1929. (342,352.)

33,353. "Electric distant controlling system." S. J. Harley. November 2nd, 1929. (342,354.)

33,615. "Electrical turning gear for starting internal-combustion engines." Sir F. H. Royce and Rolls Royce, Ltd. November 5th, 1929. (Addition to 280,709.) (342,367.)

33,625. "Loud-speakers." F. Horace-Hulme. November 5th, 1929. (342,369.)

33,636. "Printing telegraphy." Standard Telephones and Cables, Ltd., B. B. Grace, T. S. Skillman, A. H. Roche, and E. K. Sandeman. November 5th, 1929. (342,370.)

33,637. "Current-regulating devices." British Thomson-Houston Co., Ltd. November 5th, 1928. (342,371.)

34,042. "Release of alternating-current switches." Siemens-Schuckertwerke Akt. Ges. November 9th, 1928. (342,385.)

34,125. "Fusible cut-outs for electric circuits." H. Doncis. November 8th, 1929. (342,388.)

34,206. "Electrical measuring instruments." R. Gottfried. November 8th, 1929. (342,394.)

34,428. "Regulating the voltage over long lines for specially strong increases in voltage." Siemens-Schuckertwerke Akt. Ges. November 12th, 1928. (342,401.)

35,478. "Circuit interrupters." A. Rudman and Associated Electrical Industries, Ltd. November 20th, 1929. (342,418.)

35,499. "Electrodes for high-frequency currents." S. Offenbacher. November 20th, 1929. (342,419.)

35,873. "Apparatus for taking stereoscopic X-ray photographs." Naamlooze Vennoot-schap Philips' Glocilampentabrieken. November 24th, 1928. (342,424.)

35,958. "Electric motor for phonographs and the like." J. Bethenod. December 8th, 1928. (342,427.)

36,837. "Alternating-current potentiometer." A. Campbell. December 2nd, 1929. (Cognate application, 13,408/30.) (342,441.)

36,907. "Scaling tools, more particularly for tubes and the like." Electric Scaling Hammers, Ltd., and A. E. Hernades. December 2nd, 1929. (342,442.)

37,230. "Electric motor control systems." General Electric Co., Ltd., and H. J. Coates. December 4th, 1929. (Cognate application, 39,904/29.) (342,448.)

39,465. "Loud-speaking telephones." Lissen, Ltd., and R. P. Richardson. December 24th, 1929 (342,476.)

39,400. "Process of, and apparatus for, galvanically coating articles with chromium." A. Butziger. December 24th, 1929. (342,477.)

39,618. "Teleprinting systems." Siemens & Halske Akt. Ges. December 28th, 1928. (342,479.)

1930.

180. "Method of, and apparatus for, recording electrical signals." M. Volmer. January 2nd, 1930. (342,486.)

1,083. "Systems of electric motor control." British Thomson-Houston Co., Ltd. January 11th, 1929. (342,493.)

1,549. "Electric contact-making relays." Coventry Automatic Telephones, Ltd., and C. W. Wilman. January 16th, 1930. (342,497.)

3,153. "Control of switches in totalisator systems." Ericsson Telephones, Ltd., and F. Limb. January 30th, 1930. (342,518.)

3,219. "High-voltage bushing devices." Associated Electrical Industries, Ltd. February 6th, 1929. (342,521.)

3,917. "Manufacture of electrical insulating tubes." W. W. Triggs (Meirowsky & Co. Akt. Ges.). February 5th, 1930. (342,530.)

5,437. "Luminous electric discharge tubes." General Electric Co., Ltd. February 20th, 1929. (342,549.)

5,694. "Telephone dial mechanisms." S. A. Conklin. February 20th, 1930. (342,552.)

6,675. "Power-actuated typewriters." H. Wade (Electromatic Typewriters, Inc.). February 28th, 1930. (342,558.)

7,920. "Electric discharge lamps." General Electric Co., Ltd., J. W. Ryde, and N. L. Harris. March 11th, 1930. (342,574.)

11,605. "Telephone cables with star quads." Compagnie Générale d'Electricité. May 23rd, 1929. (342,606.)

13,218. "Supports for boiling plates for electrical ovens." Maxim Soc. Anon. Fabrique d'Appareils Thermo-Electriques and H. Hofer. April 30th, 1929. (342,612.)

13,500. "Vacuum electric switches." International General Electric Co., Inc. May 2nd, 1929. (342,615.)

13,735. "Change-over device for counting trains of all kinds, more especially for the counting trains of multiple tariff electricity meters." Landis and Gyr Soc. Anon. June 27th, 1929. (342,616.)

14,730. "Electrically-driven centrifugal machines." Siemens-Schuckertwerke Akt. Ges. June 26th, 1929. (342,622.)

15,689. "Harpoon for killing whales and other sea animals by electricity." B. Holm-Hansen. May 25th, 1929. (Addition to 336,551.) (342,627.)

16,318. "Electric motor-control systems." British Thomson-Houston Co., Ltd. May 27th, 1929. (342,630.)

16,772. "Transformers." International General Electric Co., Inc. May 30th, 1929. (342,633.)

17,638. "Devices for translating mechanically-recorded vibrations into electric oscillations." Vega Manufacturing Corporation. June 12th. 1929. (342,635.)

18,080. "Multiple electric motor drives." International General Electric Co., Inc. June 12th, 1929. (342,639.)

19,553. "Signalling systems for railways." General Railway Signal Co. July 1st, 1929. (342,640.)

20,726. "Arc-ignition device for metal-vapour rectifiers." Gleichrichter Ges. July 17th, 1929. (342,642.)

21,060. "Electric rectifiers." British Thomson-Houston Co., Ltd. July 11th, 1929. (342,643.)

25,848. "Electrical pick-ups." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 30th, 1929. (342,645.)

36,508. "Method of preparing magnetic materials." Electrical Research Products, Inc. December 13th, 1928. (Divided application on 32,843/29.) (342,360.)

39,163. "Loaded submarine cables." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). October 25th, 1929. (Divided application on 342,331.) (342,301.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against either of the proposed marks may be entered within one month from **February 18th**:—

Dousona (lettering and design). No. 518,077. Class 8. Radio-telephonic and telegraphic apparatus.—Dousona (1930), Ltd., Duppas Hill Lane, Croydon.

Palladium. No. 519,401. Class 13. Electric lamps (ordinary).—L. Benn and Co., Ltd., 8, Colonial Avenue, Minories, E.C.3.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ACCRINGTON.—Extensions, Springhill schools (£12,000) for the borough E.C.; director of education.

AIRDRIE.—Municipal offices; burgh surveyor.

BANBURY.—Houses (78) for the T.C.; Gay & Wilcox, builders, Orpington, Kent.

BARNET.—Extensions, Wellhouse Hospital (£11,685); Alfred Saxon, Snell & Phillips, architects.

BEDLINGTON (NORTHUMBERLAND).—Houses (1,165) during next five years for the U.D.C.

BLACKPOOL.—Houses (250); borough engineer. Biscuit factory, Devonshire Road, for Bee Pee Biscuits, Ltd.

BLYTH (NORTHUMBERLAND).—Senior school, Bebside; borough engineer.

BOURNEMOUTH.—New schools, Charminster, and rebuilding of school on Lowther Road site, for the E.C.; borough engineer.

BRECONSHIRE.—Secondary school, Cefn Coed, for the county E.C.; director of education, Brecon.

CANTERBURY.—Houses (66) for the T.C.; city surveyor.

CHADDERTON.—Houses (60) for the U.D.C.; surveyor.

CHESTER.—County offices, Chester Castle; county architect.

CHESTER-LE-STREET.—Cinema for Dixon Scott, North Shields; Dixon & Bell, Pearl Buildings, Newcastle-on-Tyne.

CHORLTON-CUM-HARDY.—Bank, Barlow Moor Road, for the Union Bank of Manchester, Ltd.; Chas. Swain and Partners, 53, King Street, Manchester.

COCKENZIE (EAST LOTHIAN).—Town Hall; burgh surveyor.

CONSETT.—Houses (68); J. J. Eltringham, architect and surveyor, Blackhill, Durham.

COVENTRY.—Arcade and 24 shops with showrooms for the T.C.; city engineer.

CUMBERLAND.—Conversion of Dovenden Hall into colony for mentally defective (£28,000); Armstrong & Co., contractors, Cockermouth.

DARLINGTON.—New wing, Darlington Hospital (£10,000); C. W. Milburn, architect.

DARTFORD.—Houses (56), Darenth, for the R.D.C.; surveyor.

DENBIGH.—Extension, North Wales Counties Mental Hospital (£77,000); Dryland & Preston, builders, Blackpool.

DONCASTER.—Police quarters, with electrical work, for the T.C.; Harold Cooper & Son, Ltd., builders, Conisborough.

DORSET.—Schools, Broadstone, Corfe Castle, Gillingham, Shaftesbury, Wareham and Verwood, for the county E.C.; director of education, Dorchester.

DUNDEE.—Buildings for the school of art (£11,000); principal, Technical College.

ESTON.—School, Argyle Road; Rev. Canon English.

EVESHAM.—Factory for Wisbech Produce Canners, Ltd., of Lynn Road; Harold & Dicks, architects, 1, Market Place.

FELLING (Co. DURHAM).—Schools and swimming baths for the T.C.

FOLKESTONE.—School for the R.C. managers; Rev. Charles Coote, Guildhall Street.

GAINSBOROUGH.—Flour mill extensions, with electrical equipment, for Townrow, Ltd.; J. C. Wooler, managing director.

GLASGOW.—Houses (900), Possil; housing director. Baths and washhouse, Barrowfield Street (£38,000). Child and welfare centre (£17,500); city engineer.

HADDINGTON.—Alterations and additions to County Buildings (£21,500); East Lothian C.C.

HAMPSHIRE.—Extensions, County Girls' School (£12,750), for the county E.C., Winchester.

HASTINGS.—Hospital extensions (£18,000), fire station £18,000), grammar school (£70,000), and Town Hall (£250,000), for the T.C.; borough surveyor.

HERTFORDSHIRE.—Schools, Abbots Langley, Barnet, Cheshunt, Great Berkhampstead, Harpenden, Hitchin, Letchworth, Waltham Cross, and Watford, for the E.C.

INCE-IN-MAKERFIELD.—Houses (56) for the U.D.C.; W. Thornley, architect, 46, Wallgate, Wigan.

IRISH FREE STATE (ENNIS, Co. CLARE).—Alterations to the County Clare Mental Hospital for the Committee of Management; Beckett & Harrington, architects, 97, Stephen's Green, Dublin.

KENT.—Secondary schools, Ashford (North), Sidcup, Sturry, Hersden, Cudham, Leaves Green, Sittingbourne (West), and Tonbridge, for the county E.C.; W. H. Robinson, architect, Springfield, Maidstone.

LEYBOURNE.—Mental colony, Grange estate (£69,500); Kent C.C.

LINCOLN.—Extensions, including engineering and electrical engineering department, technical college, for the city E.C.; director of education.

LIVERPOOL.—Cinema, London Road (£150,000); A. E. Shennan, architect, 14, N. John Street.

LONDON (STREATHAM VALE, S.W.).—Holy Redeemer Church (£12,250); Rev. C. P. Turton, vicar.

(EALING, W.).—Houses (61), Kingsley Avenue; G. Wimpey and Co., Ltd., Hammersmith, W. Houses (93), Hill View Villas, Elmbank Way and Brookbank Avenue; R. J. Ward, architect, 107, Uxbridge Road, W.

LOUTH.—Houses (75) for the T.C.; borough surveyor.

LOWESTOFT.—Alterations and additions, Palace Cinema; Yarmouth and Gorleston Investment and Building Co.

MIDDLESBROUGH.—School, Longlands estate, for the borough E.C.; director of education.

NEWCASTLE-ON-TYNE.—Two secondary schools, west side of the city; director of education.

NORTHAMPTON.—Houses (108) for the T.C.; A. Fidler, borough engineer.

POOLE.—Municipal buildings (£59,790) for the T.C.; Whitelock & Co., builders, Parkstone.

PORT SETON.—Town Hall; burgh surveyor.

ROCHDALE.—Fire station and dwellings (£52,000); borough engineer.

ROTHERHAM.—Houses (100) for the R.D.C.; A. E. Lant, engineer.

SALISBURY.—School (£24,717) for the city E.C.; Edward Lanzey & Son, builders.

SCARBOROUGH.—Hinderwell school (£20,000) for the borough E.C.; H. C. Hollis, architect, 34, Paternoster Row, London, E.C.

SHEFFIELD.—Additions and improvements to the Central Picture House, The Moor; Chapman & Jenkinson, architects, Norfolk Row. Church, Shiregreen estate; Anglican authorities.

SHANKLIN (ISLE OF WIGHT).—Town Hall reconstruction (£14,000) for the U.D.C.; surveyor.

STIRLING.—Cinema, Shore Road, for Associated British Cinemas Ltd., London, W.

STOCKPORT.—School (700 places) for the borough E.C.; A. Lawton, secretary.

STOKE-ON-TRENT.—Senior school for the borough E.C. (£26,767); P. Pemberton, builder; Senior school (£18,100); Harper Bros., builders.

SUNDERLAND.—Houses (68) H. Bell & Sons, Sunderland Road, Ryhope.

SURBITON.—Library (£10,663) for the U.D.C.; W. H. Gaze and Sons, Ltd., builders.

UPHOLLAND.—Church, Primitive Methodist trustees, Dingmoor; W. Thornley, architect, 46, Wallgate, Wigan.

WEDNESBURY.—Houses (122) for the T.C.; borough surveyor.

WEYMOUTH.—Extensions, Poor Law Institution (£10,670), for Dorset Public Assistance Committee; county architect, Dorchester.

WIGAN.—School, Beech Hill, for the borough E.C.; director of education.

WILTSHIRE.—Central schools, Marlborough, for the county E.C.; director of education, Trowbridge.